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EPSON

Slip printer

TM-U590 series

Specification

STANDARD	
Rev. No.	I
Notes	

Copied Date	, ,
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SEIKO EPSON CORPORATION

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Revisions		Design Section			Sheet Rev. No.					
Rev.	Document	WRT	CHK	APL	Sheet	Rev.	Sheet	Rev.	Sheet	Rev.
A	Enactment	Y.Ito	--	K.Ito	I	H	18	H	42	H
B	Change	Y.Ito	--	K.Ito	II	H	19	H	43	H
C	Change	Y.Ito	--	R.Kanai	III	H	20	H	44	H
D	Change	Y.Ito	--	R.Kanai	IV	H	21	H	45	H
E	Change	Matsumoto	--	R.Kanai	V	H	22	H	46	H
F	Change	Koakutsu	--	Y.Ito			23	I	47	H
G	Change	Inakoshi	--	Y.Ito			24	H	48	H
H	Change	Koakutsu	--	Omura	1	H	25	H	49	H
I	Change	Endo	--	Omura	2	H	26	H	50	H
					3	H	27	H	51	H
					4	H	28	H	52	H
					5	H	29	H	53	H
					6	H	30	H	54	H
					7	H	31	H	55	H
					8	H	32	H	56	H
					9	G	33	H	57	H
					10	H	34	H	58	H
					11	H	35	H	59	H
					12	H	36	H	60	H
					13	H	37	H	61	H
					14	H	38	H	62	H
					15	H	39	H	63	H
					16	H	40	H	64	H
					17	H	41	H	65	H

TITLE	Front Part					Contents	Appendix	Total
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TM-U590 series Specification (STANDARD)	1	8	--	2	3	141	12	167

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A	Enactment				66	H	90	H	123	H
B	Change				67	H	91	H	124	H
C	Change				68	H	92	H	125	H
D	Change				69	H	93	H	126	H
E	Change				70	H	94	H	127	H
F	Change				71	H	95	H	128	H
G	Change				72	H	96	H	129	H
H	Change				73	H	97	H	130	H
I	Change				74	H	98	H	131	H
					75	H	99	H	132	H
					76	H	100	H	133	H
					77	H	101	I	134	H
					78	H	111	H	135	H
					79	H	112	H	136	H
					80	H	113	H	137	H
					81	H	114	H	138	H
					82	H	115	H	139	H
					83	H	116	H	140	H
					84	H	117	H	141	H
					85	H	118	H		
					86	H	119	H		
					87	I	120	H		
					88	H	121	H		
					89	H	122	H		

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A	Enactment				App.1					
B	Change				App.2					
C	Change				App.3					
D	Change				App.4					
E	Change				App.5					
F	Change				App.6					
G	Change				App.7					
H	Change				App.8					
I	Change				App.9					
					App.10					
					App.11					
					App.12					

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REV.	SHEET	CHANGED CONTENTS
A		Enactment
B	10	1.10 Reliability [Change] 1) Life The MICR reader is ..... holding roller, etc.) ↓ The MICR reader is ..... the Wearout Period. 2) MTBF Failure is defined ..... of accidental failure. ↓ Failure is defined ..... the Random Failure Period. 3) MCBF This is an average ..... and accidental failures. ↓ This is an average ..... of 12 million lines.
	15	2.1.1.4 XON/XOFF transmit timing NOTES: • In case ②, ... off-line state. [Addition]
	16	2.1.1.5 Notes on setting DIP switch 2-1 to ON 1) ....., printing stops due to a paper-end,... [Deleted]
	23	Example: ..... (when the TOF/BOF sensor detects that the paper is present), ... [Addition]
		ASB status bit [Change]
	26	2.1.3.2 Switching between on-line and off-line •When the receive buffer becomes full.(∗1) ↓ •During paper feeding using the FORWARD/REVERSE button. [Change]
		(∗1): 1 When the remaining ..... 2 The printer ignores ..... [Deleted]
	28	2.1.3.4 XON/XOFF transmit timing ....., refer to Section 3.3.3. ↓ ....., refer to Section 2.1.1.6 [Change]
	57	Table 3.7.3 Unrecoverable Errors Thermistor error The internal wirings ..... correctly ↓ thermistor is ..... not connected. [Change]
	114	**FS 2 c1 c2 *d[k]*** command → FS 2 c1 c2 *d1 ... dk* [Change]

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REV.	SHEET	CHANGED CONTENTS
C	6	Figure 1.5.2 Values are changed. [Corrected]
	62	5.3 Consumables •Ribbon cassette ERC-31(B) [Addition]
	94	**ESC f** ***t1 t2*** command [Default] *t2* = 0 → *t2* = 5 [Corrected]
	101	GS I *n* Table bit0 On 02 2 → bit0 On 01 1 bit1 On 02 2 Auto cutter equipped. → bit1 Off 00 2 Auto cutter is not equipped [Corrected]
	102-124	**FS a 0** command Bit 4 and 5 is newly assigned. Description for bit 4 and 5 is added. [Addition]
D	I	General Features •Optional Magnetic .... [Deleted] •..... (Available only for ..... model) [Addition]
	II	1.6 All descriptions are deleted. [Deleted]
	IV	3.12 and 3.13 All descriptions are deleted. [Deleted]
	VI	6.5 All descriptions are deleted. [Deleted]
	6-8	Figure 1.5.2 MICR nead position is deleted. [Deleted] 1.6 All descriptions are deleted. [Deleted]
	10	1.10 Reliability MICR reader mechanism [Deleted]
	23	2.1.2.7 100 bytes → 99 bytes [Corrected]
	33	2.2.4 Customer display connector (Available only for ..... model) [Addition]
	36	MICR command lists [Deleted]
	37	3.2.1 Page 0 BS and CAN codes are deleted. [Deleted]
	50	Table 3.3.3 Bit 5 is assigned as Internal use. [Addition]
	53	3.4 Panel LED Indicators Figure 3.4.4 (when ..... reader) [Deleted]
	60	3.12 and 3.13 All descriptions are deleted. [Deleted]
	62	5.2 Options •MICR reader [Deleted]
	71	**DLE EOT** *n* command *n* = 5 : Slip paper status bit 2 On is deleted [Deleted]

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REV.	SHEET	CHANGED CONTENTS
D	72, 73	**DLE ENQ *n*** command *n* = 3 is deleted. [Deleted]
	101	**GS I *n*** command *n* = 2, 50 Type ID bit3 On is deleted. [Deleted]
	109	**GS a *n*** command Fourth byte bit 0 On is deleted. [Deleted]
	119 - 127	6.6 All descriptions are deleted. [Deleted]
	App.4	Appendix C MICR commands are deleted. [Deleted]
E	All	"Confidential" is written in the header of all pages.
	I	"Confidentiality Agreement" [Addition]
	III-V	Table of Contents 1.6 through 1.11 are renumbered. 3.2.10 Page 19 is newly added. 3.2.11 and 3.2.13 are renumbered. 6.3 Exception Processing is deleted. 6.4 Commands Description is renumbered to 6.3
	7	1.8 EMI and Safety Standards Applied Descriptions are changed. [change]
	43	3.2.10 Page 19 (PC858: Euro) [Addition]
	44, 45	3.2.11 and 3.2.13 are renumbered.
	61	6.3 Exception Processing All descriptions are deleted. [Deleted]
	62	6.4 Commands Description is renumbered to 6.3
	92	**ESC t *n*** command *n* = 19 is newly added. [Addition]
F	All	All pages are renumbered due to addition of the Thai font tables.
	II	GENERAL FEATURES TM-U590M (supporting print Kanji characters print with serial interface) → TM-U590M (supporting print Kanji characters print with serial interface) (*1) NOTE *1: [Addition]
	1	1.2 Character Specifications The multilingual .... [Addition] Thai characters ... [Addition]
	2	Table 1.2.1 Thai font A and B [Addition]
	45 - 53	3.2.11, Page 20 - 3.2.17, Page 26 [Addition] 3.2.11 → 3.2.18, 3.2.12 → 3.2.19 [Chang]
	92	**ESC R** command *n* = 11-13 [Addition]
	100	**ESC t *n*** command *n* = 20 - 26 [Addition]

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REV.	SHEET	CHANGED CONTENTS
G	9	1.9 Reliability 1) Life Print head NOTE [Added]
H	All	Page layout (changed)
	1,2	Font C (added)
	8-10	1.8 EMI and Safety Standards Applied Europe CE marking EN50082-1 → EN55024
	32 - 34	Command list (changed)
	66 - 69	3.12 Page Mode (changed)
	73	(6) Printable area (added)
	75	FF (changed)
	76	CAN (added)
	82	DLE DC4 (*n*=8) (added)
	83	ESC FF (added) ESC SP [Notes] •In standard mode, ... (added) •In page mode, ... (added)
	85	ESC ! [Notes] •ESC M can also ... (added) ESC $ [Notes] •In standard mode, ... (added) •In page mode, ... (added)
	89	ESC ∗ [Range] m=0 (page mode) (added)
	90	ESC - [Notes] •Underline can also ... ...(added)
	91	ESC 2 [Notes] (added) ESC 3 [Notes] •In standard mode, ... (added) •In page mode, ... (added)
	96	ESC D [Notes] •The character width ... (added)
	98	ESC J [Notes] •In standard mode, ... (added) •In page mode, ... (added)
	99	ESC K (corrected)
	100	ESC L (added)
	102	ESC S (added)
	103	ESC T (added)
	105	ESC V (added)
	106	ESC W (added)
	109	ESC a [Notes] •This command has, ... (added)
	113	ESC e [Notes] •In page mode, ... (added)
	117	ESC { [Notes] •This command has, ... (added)
	118	GS ! [Notes] •In standard mode, ... (added) •In page mode, ... (added)

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REV.	SHEET	CHANGED CONTENTS
H	119	GS $ (added)
	122	GS / [Notes] •In standard mode, ... (added) •In page mode, ... (added)
	124	GS L [Notes] •This command has, ... (added)
	125	GS P (corrected)
	126	GS W (corrected)
	128	GS \ (added)
	76	CAN (added)
	App.4	Table (changed)
	App.10-App.12	APPENDIX F (added)
I	23	2.1.3.1 Specifications Connecting method: (added)
	87	ESC & [Range] $0 \leq x \leq 6$ (When Font C …) (added) [Notes] …. However, font C is always … (added)
	101	ESC M (added)

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GENERAL FEATURES

The TM-U590 is a high-quality POS printer that can print on slip paper. This specification applies the following models of the TM-U590 series printer:

TM-U590	(with serial interface)
TM-U590P	(with parallel interface)
TM-U590	(supporting print Multilingual characters print with serial interface) (*1)
TM-U590P	(supporting print Multilingual characters print with parallel interface)

The printer has the following features:

- Wide slip paper capability (maximum characters per line: 88 with 7 x 9 font).
- Copy printing is possible.
- High throughput using bidirectional, minimum distance printing.
- EPSON customer display series connection (DM-D). (Available only for serial interface model)
- Command protocol based on the ESC/POS® standard.
- Automatic Status Back (ASB) function that automatically transmits changes in the printer status.
- Selectable receive buffer size (45 bytes or 4K bytes).

NOTE *1: The term “Multilingual characters” means the printer can print with one of the following: Japanese, Simplified Chinese, Traditional Chinese, or Thai. In this specification, Kanji means Japanese, Simplified Chinese, and Traditional Chinese.

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1. GENERAL SPECIFICATIONS

1.1 Printing Specifications

1) Printing method:	Serial impact dot matrix
2) Head wire configuration:	9-pin vertical line, wire pitch 0.353 mm {1/72"}
3) Head wire diameter:	0.29 mm {.01"}
4) Printing direction:	Bidirectional, minimum distance printing
5) Printing speed:	Refer to Table 1.2.1
6) Characters per line:	Refer to Table 1.2.1
7) Characters per inch:	Refer to Table 1.2.1
8) Kanji characters print:	Unidirectional two-pass printing

1.2 Character Specifications

1) Number of characters:

Alphanumeric characters: 95

International characters: 32

Extended graphics: 128 × 10 pages
(including one space page)

The multilingual character model supports printing with one of the following characters:

① Japanese (Two-pass printing font)
JIS (JIS X0208-1990) Level 1, Level 2

② Simplified Chinese (Two-pass printing font)
7580 (GB2312)

③ Traditional Chinese (Two-pass printing font)
13494 (Big 5)

④ Thai (3-pass printing font)
128 characters × 7 pages (133 character types)

2) Character structure:

Font A: 9 × 9 3-dot spacing (in half dot units)

Font B: 7 × 9 2-dot spacing (in half dot units)

Font C: 5 × 9 1-dot spacing (in normal dot units) (*1)

Kanji : 16 × 16 Left 0-dot, Right 2-dot spacing (in half dot units)

Thai:
Font A: 9 × 27 3-dot spacing (in half dot units)
Font B: 7 × 27 2-dot spacing (in half dot units)

Larger spacing can be changed by using **ESC SP** or **FS S**.

*1: Font C is supported in all models except the multilingual model. Font C is automatically selected by the printer itself when the page mode is selected or when 90° clockwise rotation is selected in the standard mode.

3) Character size: Refer to Table 1.2.1

Table 1.2.1 Characters Per Inch, Characters Per Second, Characters Per Line, Character Size

Font Type	Character Structure (Horizontal dots × vertical dots)	Character Spacing	Character Intervals (mm)	Characters Per Second (cps) (Carriage moving speed)	Characters Per Line (cpl)	Characters Size (units: mm) Width × Height
Font A	9 × 9 half dots	3 half dots	2.03	233	66	1.6 × 3.1
Font B	7 × 9 half dots	2 half dots	1.52	311	88	1.3 × 3.1
Font C	5 × 9 normal dots	1 normal dot	2.03	233	66	1.6 × 3.1
Kanji	16 × 16 (*1) half dots	2 half dots	3.06	45	44	2.7 × 2.9
Thai Font A	9 × 27 half dots	3 half dots	2.03	77	66	1.6 × 9.5
Thai Font B	7 × 27 half dots	2 half dots	1.52	103	88	1.3 × 9.5

(*1) Kanji character spacing at default setting is 2 half dots. (Kanji character spacing can be changed by **FS S**.)
Pointing speed for Kanji characters shown in table above is the case of full column printing with two-pass printing.

1.3 Ribbon

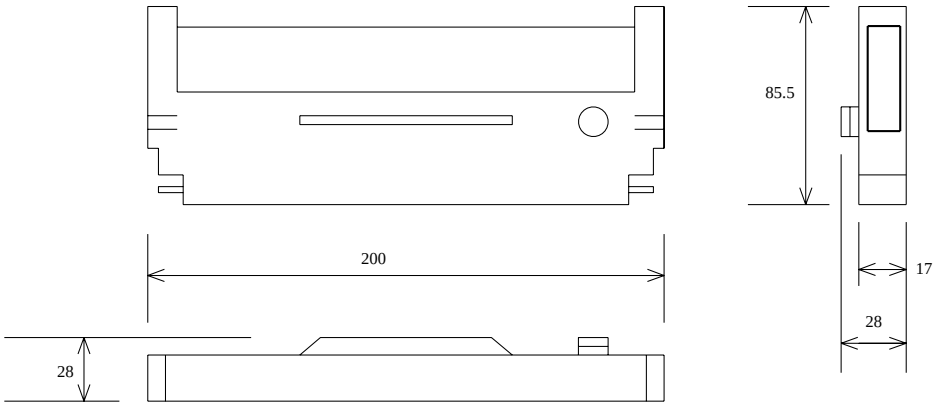
1) Type: Exclusive cassette ribbon

2) Ribbon cassette specifications:

Part number	ERC-31 (P)
Color	Purple
Ribbon life (*)	7,000,000 characters

(*): when one character consists of 18 dots

3) Ribbon cassette overall dimensions (refer to Figure 1.3.1)



[Units: mm (All the numeric values are typical.)]

Figure 1.3.1 Ribbon Cassette Overall Dimensions

NOTE: If you use ribbon cassettes other than those specified, damage may occur. Seiko Epson will not be held responsible for problems arising from the above.

1.4 Paper Feed and Paper Specification

1) Paper feed method:	Friction feed
2) Paper feed pitch:	Default 4.23 mm {1/6"} Programmable by control command in 0.176 mm {1/144"} units.
3) Paper feed speed:	Approximately 60.3 ms/line (4.23 mm {1/6"} feeding) Approximately 86.4 mm/s {3.4"/s} (continuous feeding)

4) Paper size:

a) Paper type:
- Normal paper
- Carbon copy paper
- Pressure sensitive paper

b) Total thickness: 0.09 to 0.36 mm {.0035 to .0141"} (Refer to e).)

c) Size (W × L): 70 × 70 mm to 210 × 297 mm (A4 size)
{2.76 × 2.76" to 8.27 × 11.69"}

d) Ambient temperature and copy capability

Copy capability is greatly influenced by the ambient temperature, so printing must be performed under the conditions described in Table 1.1.2.

Table 1.1.2 Relationship between Ambient Temperature and Number of Copies

Number of copies	Ambient temperature
Original + 4 copies	Approx. 20° to 45°C {68° to 113°F}
Original + 1 to 3 copies	5 to 45°C {41° to 113°F}

e) Copy capability and paper thickness:

① Normal paper (single-ply): 0.09 to 0.2 mm {.0035 to .0079"}

② Carbon copy paper combination:

5 sheets maximum
(original + 4 copies, at 20° to 45°C {68° to 113°F})

- Backing paper: 0.06 to 0.15 mm {.0023 to .0059"}
- Copy and original: 0.04 to 0.07 mm {.0015 to 0028"}
- Carbon paper: Approximately 0.035 mm {.0014"}
- Total thickness: 0.30 mm {.0118"} or less (for any combination from a single original to an original + 3 copies)
  0.36 mm {.0141"} or less (for any combination from a single original to an original + 4 copies)

③ Pressure sensitive paper: 5 sheets maximum
(original + 4 copies, at 20° to 45°C {68° to 113°F})

- Backing paper: 0.06 to 0.15 mm {.0023 to .0059"}
- Copy and original: 0.06 to 0.075 mm {.0023 to .003"}
- Total thickness: 0.24 mm {.0094"} or less (original to original + 3 copies)
  0.30 mm {.0118"} or less (original + 4 copies)

NOTES:
- When using multi-ply paper that consists of an original and three copies, be sure to print with a 9 × 9 font. If a 7 × 9 font is used, some characters on some of the copies may not be readable.
- In the same way, when printing Kanji characters which consist of many lines, be sure to consider that some of characters may not be readable regardless of number of the copies.

5) Notes on slip paper

- The slip paper must be flat, without curls or wrinkles, especially at the top edges. Otherwise, the paper may rub against the ribbon and become dirty.
- There must be no glue on the bottom edge of slip paper. Choose slip paper carefully when the glue is on the right or top edge, since paper feeding and insertion are affected by gluing conditions (e.g., glue quality, method, and length) and glue location (refer to Figure 1.4.1). Be especially careful when slip paper is wide and has the glue on the left edge, since skew may occur.
- Since the BOF sensor uses a photo sensor, do not use paper that has holes at the sensor position, or is translucent.
- Since the TOF sensor uses a reflective photo sensor and it detects from the back of slip paper, do not use paper that has holes or dark portions with low reflection (less than 40% reflection) at the sensor position.
- Use thinner paper (N30 or equivalent) between the top and bottom sheets of multi-ply paper. If thick paper is used, the copy capability is lowered.

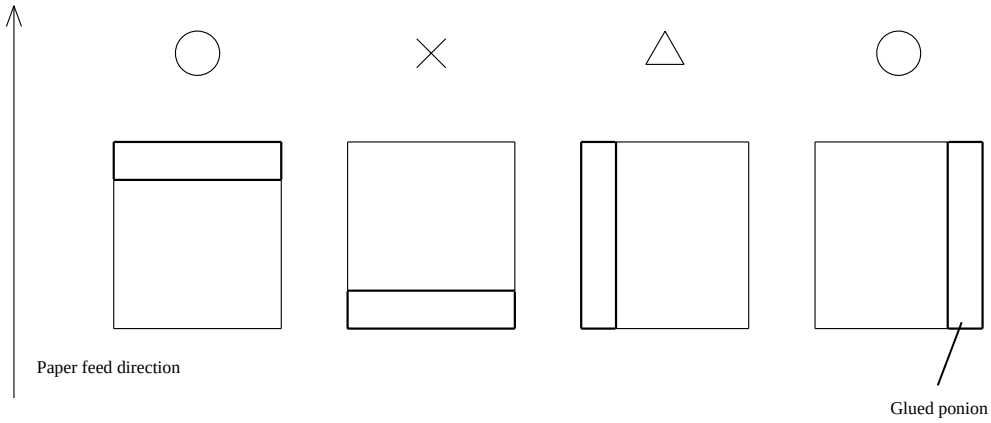
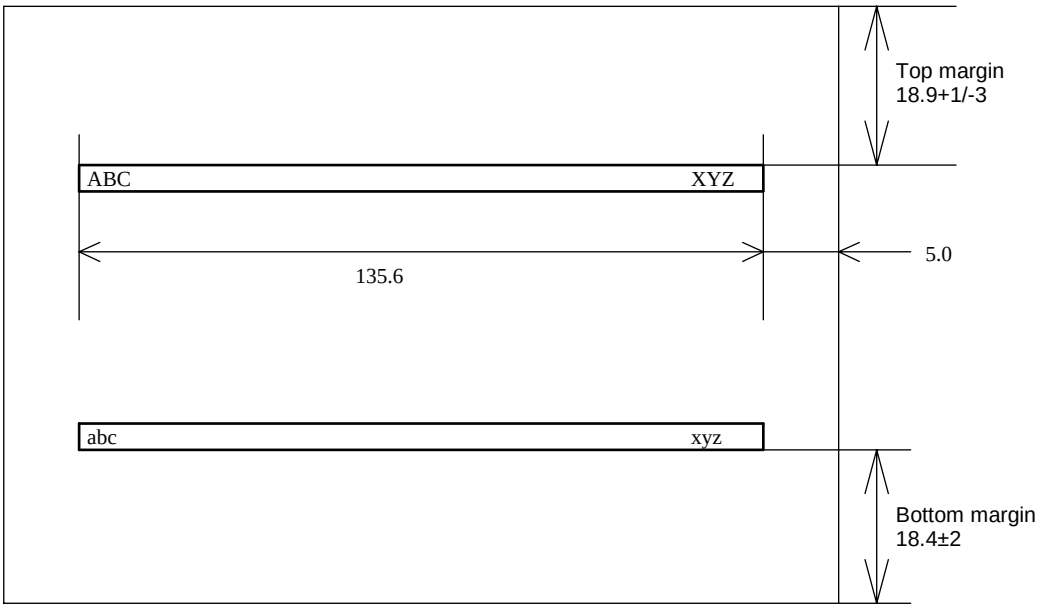


Figure 1.4.1 Slip Paper Glued Area

1.5 Printable Area



[Units: mm (All the numeric values are typical.)]

Figure 1.5.1 Slip Paper Printable Area

The top margin can be set to a minimum of 5 mm {0.19"} by using a command to feed the paper backward.

NOTES:

1. All the numeric values are typical; therefore, there may be variations depending on paper setting and insertion.
2. When inserting slip paper, be sure to use the slip side guide and form stopper. If you insert the slip paper exceeding the form stopper, the slip paper may be ejected.
3. Do not print on the slip paper in the reverse paper feed direction (in the front direction).

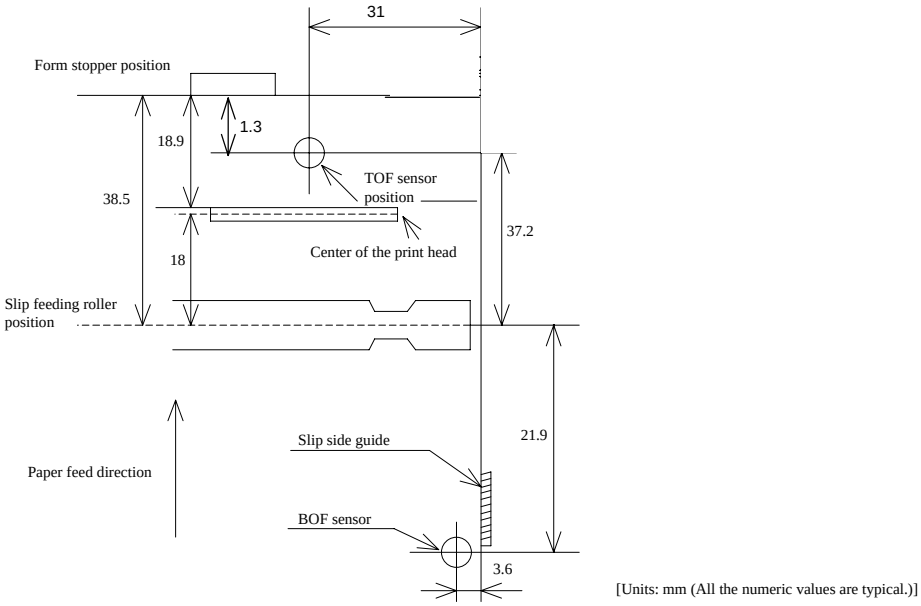


Figure 1.5.2 Slip Sensor Positions

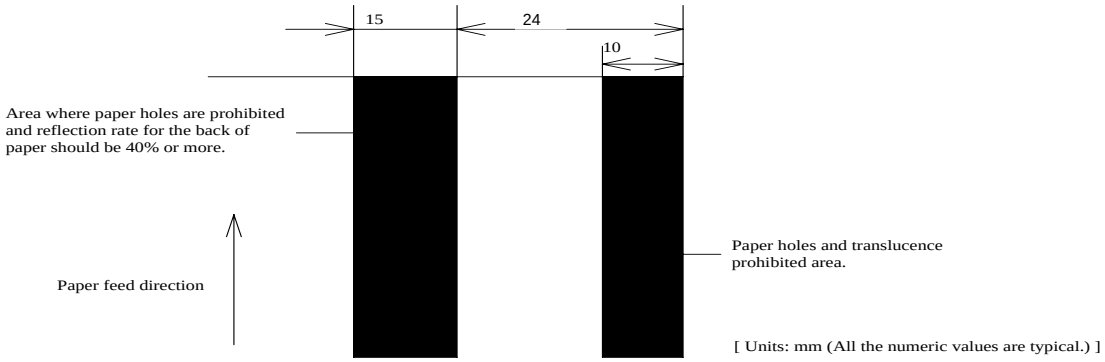


Figure 1.5.3 Paper Holes and Low Reflection Prohibited Area

1.6 Internal Buffer

1) Receive buffer: selectable as 69 bytes or 4K bytes using the DIP switch.

2) User-defined buffer (both for user-defined characters and user-defined bit images):
5K bytes

1.7 Electrical Characteristics

1) Supply voltage: +24 VDC ± 10% (optional power supply: EPSON PS-170)

2) Current consumption (at 24V except for drawer kickout driving)

Operating:

Mean: Approximately 1.9A
(Character font A α-N all columns printing)

Peak: Approximately 8.0A (20 ms)

When the print platen is released: 2.0A (200 ms)

Standby:

Mean: Approximately 0.3A

1.8 EMI and Safety Standards Applied

(EMC is tested using the optional EPSON power supply)

Europe:	CE Marking EN55022 Class B EN55024 IEC61000-4-2 IEC61000-4-3 IEC61000-4-4 IEC61000-4-5 IEC61000-4-6 IEC61000-4-11 EN45501 Safety: EN60950
North America:	EMI: FCC/ICES-003 Class A Safety: UL1950/CSA C22.2 No.950
Japan:	EMC: VCCI Class A
Oceania:	EMC: AS/NZS3548
Taiwan:	EMC Class B

Conditions of Acceptability

1) This component has been judged on the basis of the required spacings in the Standard for Information Technology Equipment, Including Electrical Business Equipment, UL1950 and CSA C22.2 No.950, Sub-Clause 2.9, which would cover the component itself if submitted for Listing.
2) This unit is intended to be supplied by a SELV circuit only.
3) The terminals and connectors have not been evaluated for field wiring.
4) Interface connectors (DK, DM-D) are not intended for TNV connection.

1.9 Reliability

1) Life (When printing alphanumeric characters)

Mechanism: 12,000,000 lines
End of life is defined to have reached the end of its life when it reaches the beginning of the Wearout Period.

Print head: 200 million characters
(When printing with font B)

NOTE: Printing pattern: Average 2 dots / wire per character
This printer has nine wire (dots) vertically and prints characters moving horizontally. If one wire prints repeatedly, the problem may occur. Consider this when you use the printer.
Example:
If the characters which consists of the horizontally adjacent dots such as "H", "L", "-", or " A" are repeatedly printed, the number of the printed lines should be ten or less. If more than ten such lines need to be printed, the printer should pause for a time longer the total printing time for each 10 lines.

2) MTBF 180,000 hours
Failure is defined as Random Failure occurring at the time of the Random Failure Period.

3) MCBF 29,000,000 lines
This is an average failure interval based on failures relating to wear up to the life of 12 million lines.

1.10 Environmental Conditions

1) Temperature: Operating: 5° to 45°C {41° to 113°F}
Storage: -10° to 50°C {14° to 122°F} (except for paper)

2) Humidity: Operating: 10 to 90% RH
Storage: 10 to 90% RH (except for paper)

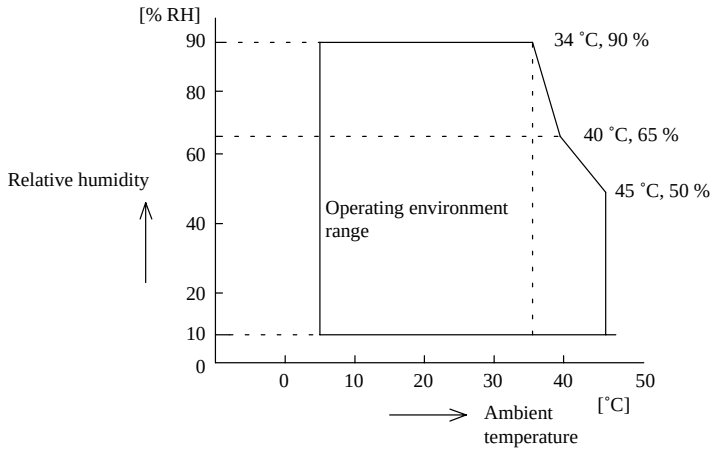


Figure 1.10.1 Operating Temperature and Humidity Range

3) Vibration resistance: When Packed:
Frequency: 5 to 55 Hz
Acceleration: Approximately 19.6 m/s^2 {2 G}
Sweep: 10 minutes (half cycle)
Duration: 1 hour
Directions: x, y, and z

No external or internal damage should be found after the vibration test, and the unit should operate normally.

4) Impact resistance: When Packed:
Package: EPSON standard package
Height: 50 cm {19.69"}
Directions: 1 corner, 3 edges, and 6 surfaces

No external or internal damage should be found after the drop test, and the unit should operate normally.

When unpacked:
Height: 5 cm {1.97"}
Directions: Lift one edge and release it (for all 4 edges).

When the printer is not printing, no external or internal damage should be found after the drop test.

5) Acoustic noise: Operating: Approximately 65 dB (Bystander position)

1.11 Installation

The TM-U590 series printer must be installed horizontally.

2. CONFIGURATION

2.1 Interface

2.1.1 RS-232 serial interface

2.1.1.1 Specifications

Data transmission:	Serial
Synchronization:	Asynchronous
Handshaking:	DTR/DSR or XON/XOFF control
Signal levels:	MARK = -3 to -15 V: Logic "1"
	SPACE = +3 to +15 V: Logic "0"
Stop bits:	1 or more
Connector (printer side):	Female DSUB-25 pin connector

The data word length, baud rate, and parity depend on the DIP switch settings. (Refer to Section 3.3.3.) The stop bit for the printer side is fixed to 1.

2.1.1.2 Switching between online and offline

The printer does not have an online/offline switch. The printer goes offline:

1) Between when the power is turned on (including reset using the interface) and when the printer is ready to receive data
2) During the self-test
3) When the cover is open
4) During paper feeding using the FORWARD/REVERSE button
5) When an error has occurred
6) When the power is out of range temporarily.

2.1.1.3 Interface connector terminal assignments and signal functions

Interface connector terminal assignments and signal functions are described in Table 2.1.1.

Table 2.1.1 TM-U590 series Printer Status and Signals

<table>
<tr><th>Pin number</th><th>Signal name</th><th>Signal direction</th><th>Function</th></tr>
<tr><td>1</td><td>FG</td><td>—</td><td>Frame ground</td></tr>
<tr><td>2</td><td>TXD</td><td>Output</td><td>Transmit data</td></tr>
<tr><td>3</td><td>RXD</td><td>Input</td><td>Receive data</td></tr>
<tr><td>4</td><td>RTS</td><td>Output</td><td>DIP SW 2-2 OFF: Same as DTR signal (Pin 20)
DIP SW 2-2 ON: Logical product of DTR signals of DM-D and TM (If both are SPACE, the printer can receive data (SPACE).)</td></tr>
<tr><td>6</td><td>DSR</td><td>Input</td><td>This signal indicates whether the host computer can receive data.
SPACE indicates that the host computer can receive data, and MARK indicates that the host computer cannot receive data.
When DTR/DSR control is selected, the printer transmits data after confirming this signal (except when transmitting data by DLE EOT, and GS a).
When XON/XOFF control is selected, the printer does not check this signal.
Changing the DIP switch setting enables this signal to be used as a reset signal for the printer (refer to Section 3.3.3).
The printer is reset when the signal remains MARK for 1 ms or more.</td></tr>
<tr><td>7</td><td>SG</td><td>—</td><td>Signal ground</td></tr>
<tr><td>20</td><td>DTR</td><td>Output</td><td>1) When DTR/DSR control is selected, this signal indicates whether the printer is busy. SPACE indicates that the printer is ready to receive data, and MARK indicates that the printer is busy. The busy condition can be changed by using DIP SW 2-1 as follows (refer to Section 3.3.3):
<table>
<tr><th></th><th rowspan="2">Printer status</th><th colspan="2">DIP SW 2-1 status</th></tr>
<tr><th>ON</th><th>OFF</th></tr>
<tr><td rowspan="5">Offline</td><td>1. During the period from when the power is turned on (including resetting using the interface) to when the printer is ready to receive data.</td><td>BUSY</td><td>BUSY</td></tr>
<tr><td>2. During the self-test.</td><td>BUSY</td><td>BUSY</td></tr>
<tr><td>3. When the cover is open.</td><td>—</td><td>BUSY</td></tr>
<tr><td>4. During paper feeding using the FORWARD/REVERSE button.</td><td>—</td><td>BUSY</td></tr>
<tr><td>5. When an error has occurred.</td><td>—</td><td>BUSY</td></tr>
<tr><td></td><td>6. When the receive buffer becomes full. (*1)</td><td>BUSY</td><td>BUSY</td></tr>
</table></td></tr>
</table>

Table 2.1.1 TM-U590 series Printer Status and Signals (Continued)

Pin number	Signal name	Signal direction	Function
			2) When XON/XOFF control is selected: The signal indicates whether the printer is correctly connected and is ready to receive data. SPACE indicates that the printer is ready to receive data. The signal is always SPACE except in the following cases: • During the period from when the power is turned on to when the printer is ready to receive data • During the self-test
25	INIT	Input	Changing the DIP switch setting enables this signal to be used as a reset signal for the printer. The printer is reset when the signal remains SPACE for 1 ms or more.

(*1) • When the remaining space in the receive buffer drops to 16 bytes, the printer status becomes "buffer full" and it remains "buffer full" until the space in the receive buffer increases to 26 bytes.
• The printer ignores the data received when the remaining space in the receive buffer is 0 bytes.

2.1.1.4 XON/XOFF transmit timing

When XON/XOFF control is selected, the printer transmits XON or XOFF signals as follows. Transmit timing differs depending on the DIP SW2-1 setting.

Table 2.1.2 XON/XOFF Transmit Timing

	Printer status	DIP SW 2-1 status	
		ON	OFF
XON transmission	① When the printer goes online after turning on the power (or reset using interface)	Transmit	Transmit
	② When the receive buffer is released from the buffer full state	Transmit	Transmit
	③ When the printer switches from offline to online	—	Transmit
	④ When the printer recovers from an error using the **DLE ENQ 1** or **DLE ENQ 2** commands	—	Transmit
XOFF Transmission	⑤ When the receive buffer becomes full	Transmit	Transmit
	⑥ When the printer switches from online to offline	—	Transmit

NOTES: • The XON code is <11>H and the XOFF code is <13>H.
• In case ②, XON is not transmitted when the
• In case ③, XON is not transmitted when the receive buffer is full.
• In case ⑥, XOFF is not transmitted when the receive buffer is full.

2.1.1.5 Notes on setting DIP switch 2-1 to ON

1) The printer mechanism stops but does not become busy when: an error has occurred, the cover is open, or paper is fed using the FORWARD/REVERSE button.
2) When setting DIP switch 2-1 to ON to enable handshaking with the printer, be sure to check the printer status using the **GS a** command and the ASB function. In this setting, the default value of *n* for **GS a** is 2. The printer automatically transmits the printer status, depending on online/offline changes.
3) When using **DLE EOT** and **DLE ENQ**, be sure that the receive buffer does not become full.
   - When using a host that cannot transmit data when the printer is busy:

     If an error has occurred, **DLE EOT** and **DLE ENQ** cannot be used when the printer is busy due to a receive buffer-full state.
   - When using a host that can transmit data when the printer is busy:

     When the receive buffer becomes full while transmitting bit-image data, **DLE EOT** or **DLE ENQ** used while sending the bit-image data is processed as bit-image data. The data transmitted when the receive buffer is full may be lost.

     Example of use:
     Check the printer status using **GS I** or **GS r** after transmitting each line of data and use the 4K byte receive buffer. Transmit one line of data so that the receive buffer does not become full.

2.1.1.6 Notes on Resetting the Printer Using the Interface

The printer can be reset using interface pins 6 and 25 by changing the DIP switch setting (refer to Section 3.3.3, DIP switch 2).

Table 2.1.3 Reset Switching

Signal Line	DIP Switch	Reset Condition
Pin 6 (DSR)	DSW 2-7: ON	MARK level input
Pin 25 (INIT)	DSW 2-8: ON	SPACE or TTL-HIGH level input

To reset the printer, the following requirements must be satisfied.

- DC characteristics:

Table 2.1.4 Reset DC Characteristics

		Pin 6 (DSR)	Pin 25 (INIT)
Input HIGH voltage	V_{IH}	-15 to -3 V	+2 to +15 V
Input LOW voltage	V_{IL}	+3 to +15 V	-15 to + 0.8 V
Input HIGH current:	I_{IH}	-5.3 mA (maximum)	1 mA (maximum)
Input LOW current:	I_{IL}	-5 mA (maximum)	-2 mA (maximum)
Input impedance:	R_{IN}	3 kΩ (minimum)	

- AC characteristics:
  Minimum reset pulse width: TRS 1 ms (minimum)
  - When using pin 6 (DSR) (DIP switch 2-7 is ON):

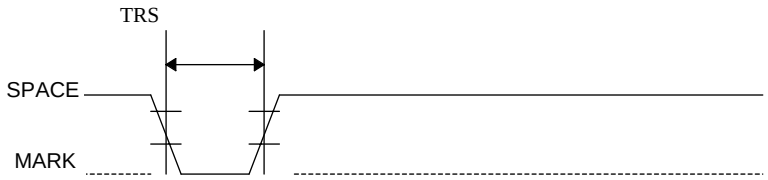


Figure 2.1.1 Minimum Reset Pulse Width (pin 6)

  - When using pin 25 (INIT) (DIP switch 2-8 is ON):

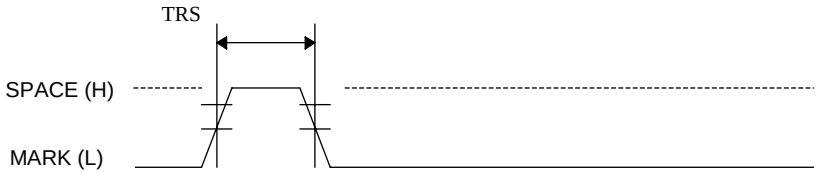


Figure 2.1.2 Minimum Reset Pulse Width (pin 25)

NOTES:
- When a signal that does not satisfy the requirements above is input, printer operation is not guaranteed. When a signal is input to pin 25 (INIT) at the TTL level, the requirements above must also be satisfied. Although a signal is input to pin 6 (DSR) at the TTL level, according to the DC characteristics described above, the operation is not guaranteed and pin 6 cannot be controlled.
- When pin 6 (DSR) and pin 25 (INIT) are open, the printer is operating.

2.1.2 IEEE 1284 Bidirectional Parallel Interface(Parallel Interface Specifications)

2.1.2.1 Compatibility Mode

(Data Transmission from Host to Printer: Centronics compatible)

(1) Specifications

Data transmission:	8-bit Parallel
Synchronization:	Externally supplied nStrobe signals
Handshaking:	nAck and Busy signals
Signal levels:	TTL compatible
Connector:	ADS-B36BLFDR176 (HONDA) or equivalent (IEEE 1284 Type B)

Reverse communication (Printer Host): Nibble or Byte Mode

(2) Switching between online and offline

The printer is not equipped with any online/offline switch. The printer is placed into offline status in either of the followings:

1) When the power is turned on or until the printer becomes ready for data transmission after it is initialized by the reset signal (nInit) from the interface.
2) During the self-test.
3) When the cover is open.
4) During paper feeding using the FORWARD/REVERSE button.
5) When the power is out of range temporarily.
6) When an error has occurred.

2.1.2.2 Reverse Mode (Data Transmission from Printer to Host)

The STATUS data transmission from the printer to the host is proceeded in the Nibble or Byte mode.

- Description

  This mode allows data transmission from the asynchronous printer under the control of the host.

  Data transmissions in the Nibble Mode are made via the existing control lines in units of four bits (Nibble). In the Byte Mode, data transmissions are proceeded by making the eight-bits data lines bidirectional.

  The both modes fail to be proceeded concurrently with the Compatibility Mode, thereby causing half duplex transmission.

2.1.2.3 Interface Pin Assignments for Each Mode

Pin	Source	Compatibility Mode	Nibble Mode	Byte Mode
1	Host	nStrobe	HostClk	HostClk
2	Host/Ptr	Data0(LSB)	Data0(LSB)	Data0(LSB)
3	Host/Ptr	Data1	Data1	Data1
4	Host/Ptr	Data2	Data2	Data2
5	Host/Ptr	Data3	Data3	Data3
6	Host/Ptr	Data4	Data4	Data4
7	Host/Ptr	Data5	Data5	Data5
8	Host/Ptr	Data6	Data6	Data6
9	Host/Ptr	Data7(MSB)	Data7(MSB)	Data7(MSB)
10	Printer	nAck	PtrClk	PtrClk
11	Printer	Busy	PtrBusy/Data3, 7	PtrBusy
12	Printer	PError	AckDataReq/Data2, 6	AckDataReq
13	Printer	Select	Xflag/Data1, 5	Xflag
14	Host	nAutoFd	HostBusy	HostBusy
15		NC	ND	ND
16		GND	GND	GND
17		FG	FG	FG
18	Printer	Logic-H	Logic-H	Logic-H
19		GND	GND	GND
20		GND	GND	GND
21		GND	GND	GND
22		GND	GND	GND
23		GND	GND	GND
24		GND	GND	GND
25		GND	GND	GND
26		GND	GND	GND
27		GND	GND	GND
28		GND	GND	GND
29		GND	GND	GND
30		GND	GND	GND
31	Host	nInit	nInit	nInit
32	Printer	nFault	nDataAvail/Data0, 4	nDataAvail
33		GND	ND	ND
34	Printer	DK_STATUS	ND	ND
35	Printer	+5V	ND	ND
36	Host	nSelectIn	1284-Active	1284-Active

* NC: Not Connected
ND: Not Defined

NOTES: 1. A prefix “n” to signal names refers to “L” active signals. To the host provided with none of the signal lines listed above, both-way communication fails.

2. For interfacing, signal lines shall use twisted pair cables with the return sides connected to signal ground level.

3. Interfacing conditions shall be all based on the TTL level to meet the characteristics described below. In addition, both rise time and fall time of each signal shall be 0.5µs or less.

4. Data transmission shall not ignore the signal nAck or Busy. An attempt to transmit data with either signal, nAck or Busy, ignored can cause lost data. (Data transmissions to the printer shall be made after verifying the nAck signal or while the Busy signal is at the “L” level.)

5. Interface cables shall be as minimum required short in length as possible.

2.1.2.4 Electrical Characteristics

DC Characteristics (Except Logic-H, +5 V signals)

Characteristics	Symbol	Specifications		Conditions
		Min	Max	
Output HIGH voltage	V_{OH}	*2.4 V	5.5 V	*I_{OH}=0.32 mA
Output LOW voltage	V_{OL}	-0.5 V	*0.4 V	*I_{OL}=-12 mA
Output HIGH current	I_{OH}	0.32 mA	-	V_{OH}=0.32 V
Output LOW current	I_{OL}	-12 mA	-	V_{OL}=0.4 V
Input HIGH voltage	V_{IH}	2.0 V	-	
Input LOW voltage	V_{IL}	-	0.8 V	
Input HIGH current	I_{IH}	-	-0.32 mA	V_{IH}=2.0 V
Input LOW current	I_{IL}	-	12 mA	V_{IL}=0.8 V

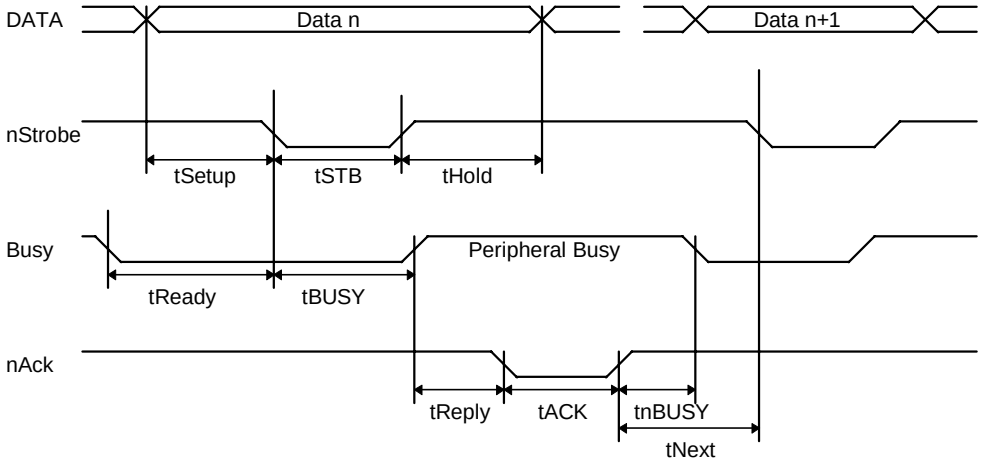
Logic-H Signal Sender Characteristics

Characteristics	Symbol	Specifications		Conditions
		Min	Max	
Output HIGH voltage	V_{OH}	3.0 V	5.5 V	
Output LOW voltage	V_{OL}	-	2.0 V	While the power is OFF

2.1.2.5 Data Receiving Timing (Compatibility Mode)

+5 V Signal Sender Characteristics

Characteristics	Symbol	Specifications		Conditions
		Min	Max	
Output HIGH voltage	V_{OH}	*2.4 V	5.5 V	*I_{OH}=0.32 mA
Output LOW voltage	V_{OL}	-	- **	While the power is OFF
Output HIGH current	I_{OH}	-	0.32 mA	V_{OH}=2.4 V
Output LOW current	I_{OL}	- **	-	While the power is OFF



** No guarantee is offered to V_{OL} and I_{OL} while the power is OFF.

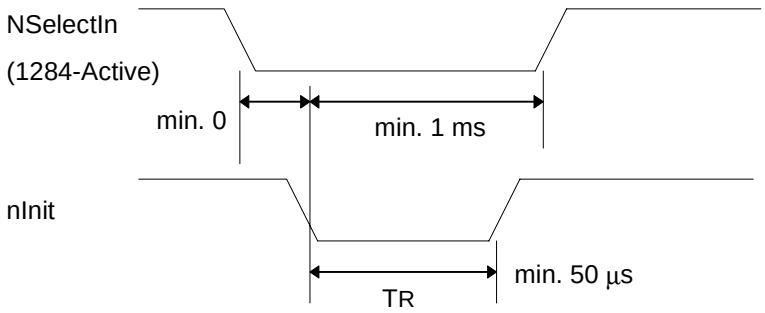
Characteristics	Symbol	Specifications	
		Min[ns]	Max[ns]
Data Hold Time (host)	tHold	750	--
Data Setup Time	tSetup	750	--
STROBE Pulse Width	tSTB	750	--
READY Cycle Idle Time	tReady	0	--
BUSY Output Delay Time	tBUSY	0	500
Data Processing Time	tReply	0	∞
ACKNLG Pulse Width	tACK	500	10 µs
BUSY Release Time	tnBUSY	0	∞
ACK Cycle Idle Time	tNEXT	0	--

*The printer latches data at a nStrobe ↓ timing

2.1.2.6 Notes on resetting the printer through the interface

When the printer is reset through the interface nInit signal (#31 pin) in Compatibility Mode, satisfy the following characteristics, however, note that the reset signal is ignored in Reverse Mode (#36 pin nSelectIn (1284-Active:"H")).

DC Characteristics	TTL level
AC Characteristics	Minimum reset pulse width TR: 50 μs (minimum)



2.1.2.7 Reception of status from the printer through the bidirectional parallel interface

In the bidirectional parallel interface specifications, the printer status transmission is available by using the both-way communication facility in the Nibble/Byte Modes in accordance with the IEEE 1284.

In this case, different from in the RS-232 serial interface specifications, the real-time interruptions from the printer to the host are disabled and thus precautions must be taken to the followings.

1) Allowable capacity of the printer internal buffer is 99 bytes (except ASB status). The status signals exceeding this capacity will be discarded. To prevent possible loss of status, the host shall be ready for data acception (Reverse Mode).
2) When ASB is used, the host is preferably in the wait state for data acception (Reverse Idle Mode). When this state is not available, the host shall enter the Reverse Mode to always monitor the presence of data.
3) When ASB is used, preference shall be given to the ASB status for transmission over the other status signals. Any accumulated ASB status signals left for transmission from the last to the newest ASB status transmission shall be transmitted together at a time as one ASB status showing the presence of change, followed by the latest ASB status.

Example: In the normal (wait) state (when the TOF/BOF sensor detects that the paper is present), the ASB status is configured as follows.

First Status	Second Status	Third Status	Fourth Status
0000 1000	0000 0000	0000 0000	0000 0000

When a sequence of operations are proceeded, the FORWARD/REVERSE button is pressed and released, the following pieces of data are accumulated.

	First Status	Second Status	Third Status	Fourth Status	
①	0000 1000	0000 0000	0000 0011	0000 0000	Near end detection
②	0010 1000	0000 0000	0000 0011	0000 0000	FORWARD/REVERSE button is pressed
③	0000 1000	0000 0000	0000 0011	0000 0000	FORWARD/REVERSE button is released

When the ASB status is received following this, a total of eight (8) bytes of ASB will be transmitted as follows.

Accumulated ASB (①+②+③)

	First Status	Second Status	Third Status	Fourth Status
Accumulated ASB (①+②+③)	0010 1000	0000 0000	0000 0011	0000 0000
+	First Status	Second Status	Third Status	Fourth Status
The latest ASB (③) Fourth Status	0010 1000	0000 0000	0000 0011	0000 0000

2.1.2.8 Notes on setting DIP switch 2-1 to ON

(1) The printer mechanism stops but does not become BUSY in the following cases:

- When an error occurs.
- When the cover is open.
- When paper is fed using the FORWARD/REVERSE button.

(2) When handshaking with the printer while using this switch setting, make sure to monitor the printer with the **GS a** command and the ASB function.

With this switch setting, the default value of the **GS a** command *n* is 2. This automatically transmits the printer status, depending on online/offline changes.

(3) When using the **DLE EOT**, **DLE ENQ**, or **DLE DC4** command, make sure that the receive buffer does not become full.

- Notes on using a host that cannot transmit data when the printer is BUSY:

  If an error occurs when the receive buffer is full and the printer is BUSY, the **DLE EOT**, **DLE ENQ**, and **DLE DC4** commands cannot be used.

- Notes on using a host that can transmit data when the printer is BUSY:

  If a **DLE EOT**, **DLE ENQ**, or **DLE DC4** command is used while sending bit-image data, and the receive buffer-full state is encountered during transmission of the data, the **DLE EOT**, **DLE ENQ**, or **DLE DC4** is processed as bit-image data.

  In addition, the data transmitted during the receive buffer-full state may be lost.

  Example of use:

  Set the receive buffer to 4K bytes, and check the status with **GS r** for each line of printing transmitted. Make sure that the data for printing each line does not cause the printer to enter the receive buffer-full state.

2.1.3 RS-485 Serial Interface

(RS-485 serial interface specification is a dealer option.)

2.1.3.1 Specifications (RS-485 compatible)

Data transmission:	Serial
Connecting method:	point to point
Synchronization:	Asynchronous
Handshaking:	Depend on the DIP switch settings (DTR/DSR or XON/XOFF control)
Signal levels:	2.0 to 5.0 V: Logic 1 0.0 to 0.8 V: Logic 0
Baud rates:	2400, 4800, 9600, 19200 bps (bps: bits per second)
Data word lengths:	7 or 8 bits
Parity settings:	None, even, odd
Stop bits:	1 or more
Connector (printer side):	Female D-SUB25 pin connector

NOTES:
- The handshaking data word length, baud rate, and parity depend on the DIP switch (Refer to Section 3.3.3)
- Data transmitted from the printer has 1 stop bit (fixed).

DR1 > DR2 CS1 > CS2 indicates that:
Channel 1 is high.
Channel 2 is low.

DR1 < DR2 CS1 < CS2 indicates that:
Channel 2 is high.
Channel 1 is low.

Table 2.1.6 Signal Levels and Communication Control Functions

CS1	CS2	Function
H	L	Communication is available
L	H	Communication is not available

If the electric potential of CS1 is higher than that of CS2, the printer is ready for communication (the host is ready to receive data). If the electric potential of CS1 is lower than that of CS2, the printer is not ready for communication (the host is not ready to receive data).

Table 2.1.7 Signal Levels and Communication Control Functions

DR1	DR2	Function
H	L	Communication is available
L	H	Communication is not available

If the electric potential of DR1 is higher than that of DR2, the printer is ready for communication (the host is ready to receive data). If the electric potential of DR1 is lower than that of DR2, the printer is not ready for communication (the host is not ready to receive data).

2.1.3.2 Switching between online and offline

The printer does not have an online/offline switch.

The printer goes offline:

1) Between when the power is turned on (including reset using the interface) and when the printer is ready to receive data.
2) During the self-test.
3) When the cover is open.
4) When a temporary abnormality occurs in the power supply voltage.
5) When an error has occurred.
6) During paper feeding using the FORWARD/REVERSE button.

2.1.3.3 Interface pin assignments

Table 2.1.8 TM-U590 series Printer Status and Signals

Pin Number	Signal name	Signal direction	Function
1	FG	--	Frame ground
2	SD1	Output	Transmit data
3	SD2	Output	Transmit data
4	RD1	Input	Receive data
5	RD2	Input	Receive data
7	SG	--	Signal ground

Table 2.1.8 TM-U590 series Printer Status and Signals (Continued)

<table>
<tr><th>Pin Number</th><th>Signal name</th><th>Signal direction</th><th>Function</th></tr>
<tr><td>8
9</td><td>DR1
DR2</td><td>Output</td><td>When DTR/DRS is selected, this signal indicates whether the host computer is BUSY or READY.
1)DR1>DR2 indicates that the printer is READY and DR1<DR2 indicates that the printer is BUSY. The BUSY condition can be changed depending on the offline conditions set by the DIP switches (refer to Section 3.3.3). When the DTR/DSR control is selected, the printer becomes the BUSY state (DR1<DR2) under the following conditions.
<table>
<tr><th></th><th>Printer status</th><th>DIP SW 2-1 status
ON</th><th>DIP SW 2-1 status
OFF</th></tr>
<tr><td rowspan="7">Offline</td><td>1. During the period from when the power is turned on (including resetting using the interface) to when the printer is ready to receive data.</td><td>BUSY</td><td>BUSY</td></tr>
<tr><td>2. During the self-test.</td><td>BUSY</td><td>BUSY</td></tr>
<tr><td>3. When the cover is open.</td><td>—</td><td>BUSY</td></tr>
<tr><td>4. During paper feeding using the FORWARD/REVERSE button.</td><td>—</td><td>BUSY</td></tr>
<tr><td>5. When a temporary abnormality occurs in the power supply voltage.</td><td></td><td>BUSY</td></tr>
<tr><td>6. When an error has occurred.</td><td></td><td>BUSY</td></tr>
<tr><td>7. When the receive buffer becomes full.</td><td>BUSY</td><td>BUSY</td></tr>
</table>
2)When XON/XOFF control is selected:
The signal indicates whether the printer is correctly connected and is ready to receive data. SPACE indicates that the printer is ready to receive data. The signal is always DR1>DR2 (READY) indicates that the printer is ready to receive data. The signal is always DR1>DR2 except in the following cases:
• During the period from when the power is turned on to when the printer is ready to receive data
• During the self-test</td></tr>
</table>

Table 2.1.8 TM-U590 series Printer Status and Signals (Continued)

Pin Number	Signal name	Signal direction	Function
10 11	CS1 CS2	Input	This signal indicates whether the host computer is BUSY or READY. CS1>CS2 indicates that the printer is READY and CS1<CS2 indicates that the printer is BUSY. 1)When DTR>DSR is selected: The signal is checked and data is transmitted only when the host is ready to receive data (READY) (except for transmitted by **DLE EOT** or **GS a**). 2)When XON/XOFF control is selected: Transmits data regardless of the status of this signal.

2.1.3.4 XON/XOFF transmit timing

Refer to Section 2.1.1.4.

For the DIP switch settings of the offline status, refer to Section 2.1.1.6.

2.1.3.5 Data format when using RS-485

Transmission data (8bits, none parity)

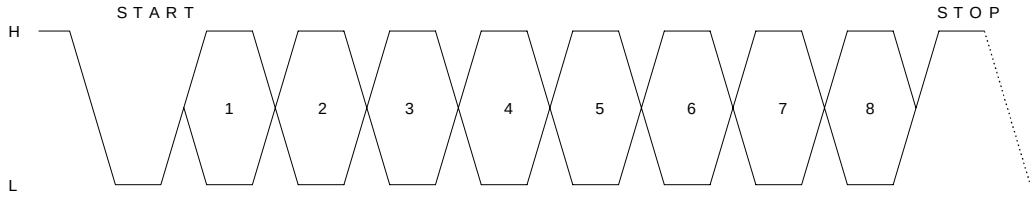


Figure 2.1.5 RS-485 Communication data format

"H" indicates:

<Printer transmission data> SD1<SD2
<Printer reception data> RD1<RD2

"L" indicates:

<Printer transmission data> SD1<SD2
<Printer reception data> RD1<RD2

The transmission data is H = 1, L = 0

NOTE: This format is used when the UART for RS-232 is connected to the RS-485 driver.

Table 2.1.11 Printer Reception Data Level

RD1	RD2	Read data
H	L	Receiving data line is low level
L	H	Receiving data line is high level

Table 2.1.12 Printer Transmission Data Level

RD1	RD2	Send data
H	L	Sending data line is low level
L	H	Sending data line is high level

2.2 Connectors

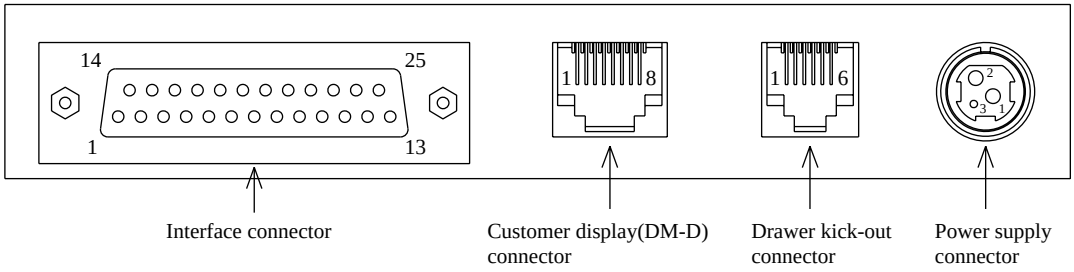


Figure 2.2.1 Serial Interface Connector Panel External Appearance

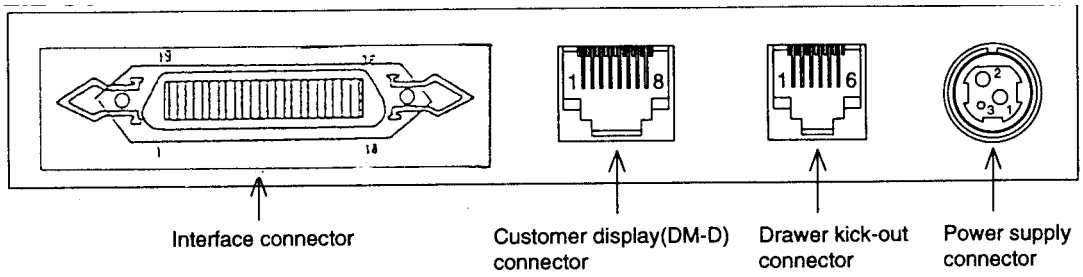


Figure 2.2.2 Parallel Interface Connector Panel External Appearance

2.2.1 Interface Connectors

Refer to Section 2.1, Interface.

2.2.2 Power Supply Connector

This connector is used to connect the printer to an external power source.

1) Pin assignments: Refer to Table 2.2.1.
2) Model: Hosiden TCS7960-532010 or equivalent

Table 2.2.1 Power Supply Connector Pin Assignments

Pin Number	Signal Name
1	+24 VDC
2	GND
3	NC
Shell	Frame GND

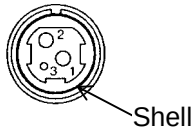


Figure 2.2.3 Power Supply Connector

2.2.3 Drawer Kick-out Connector (Modular Connector)

The pulse specified by **ESC p** is output to this connector. The host can confirm the status of the input signal by using the **DLE EOT**, **GS r**, or **GS a** (ASB) commands.

1) Pin assignments: Refer to Table 2.2.2

2) Connector model: Printer side: MOLEX 52065-6615 or equivalent
User side: 6-position 6-contact (RJ12 telephone jack)

Table 2.2.2 Drawer Kick-out Connector Pin Assignments

Pin Number	Signal Name	Direction
1	Frame GND	—
2	Drawer Kick-out drive signal 1	Output
3	Drawer open/close signal	Input
4	+24 V	—
5	Drawer Kick-out drive signal 2	Output
6	Signal GND	—

+24 V is output through pin 4 when the power is turned on. However, pin 4 must be used only for the drawer.

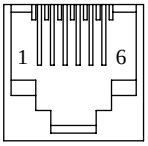


Figure 2.2.4 Drawer Kick-out Connector

3) Drawer kick-out drive signal

Output signal: Output voltage: Approximately 24 V
Output current: 1 A or less

CAUTION: To avoid an overcurrent, the resistance of the drawer kick-out solenoid must be 24 Ω or more.

Output waveform: Outputs the waveforms in Figure 2.2.5 to the points A and B in Figure 2.2.6.

t1 (ON time) and *t2* (OFF time) are specified by **ESC p**.

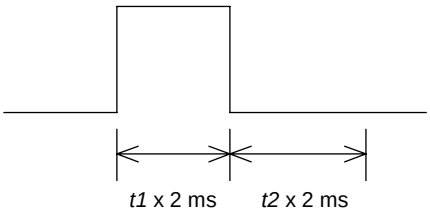


Figure 2.2.5 Drawer Kick-out Drive Signal Output Waveform

4) Drawer open/close signal

Input signal level (connector pin 3): "L" = 0 to 0.8 V

"H" = 2 to 5 V

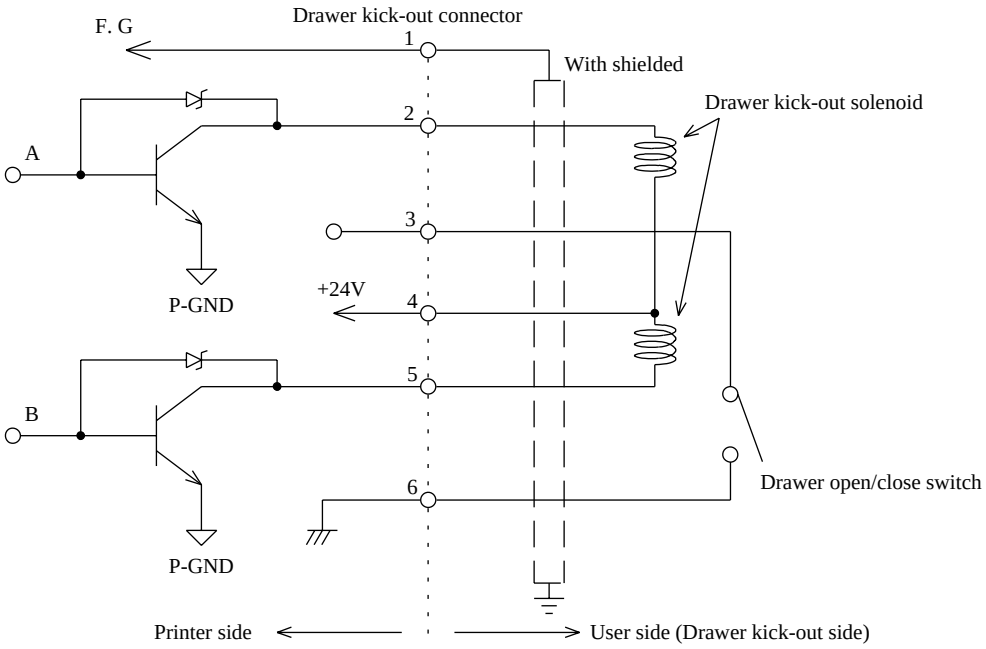


Figure 2.2.6 Drawer Circuitry

NOTES: 1. Two driver transistors cannot be energized simultaneously.
2. The driver must not be energized continuously.
3. Be sure to use the printer power supply (connector pin 4) for the drawer power source.
4. The resistance of the drawer kick-out solenoid must not be less than the specified (24 Ω). Otherwise, an overcurrent could damage the solenoid.

2.2.4 Customer Display Connector (Available only for serial interface model)

1) Model:

Receptacle: MOLEX 52065-8845 or equivalent

2) Pin assignments:

Table 2.2.3 Customer Display Connector Pin Assignments

Pin Number	Signal Name	Direction
1	FG	—
2	N.C.	—
3	TXD	Output
4	DTR	Output
5	DSR	Input
6	SG	—
7	+24	—
8	PG	—

+24 V is always output through pin 7. The driving capability is 350 mA or less. Be sure not to use customer displays other than Seiko Epson DM-D series.

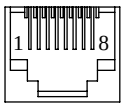


Figure 2.2.7 DM-D Connector

3. FUNCTIONS

3.1 Command List

○ indicates the corresponding command for all models.

＊ indicates the corresponding command for ANK model only.

Command	Name	Command Classification	
		Executing	Setting
HT	Horizontal tab	○	
LF	Print and line feed	○	
FF	Print and eject slip paper (in standard mode)	○	
	Print and return to standard mode (in page mode)	＊	
CR	Print and carriage return	○	
CAN	Cancel print data in page mode	＊	
DLE EOT	Real-time status transmission	○	
DLE ENQ	Real-time request to printer	○	
DLE DC4	Generate pulse in real time	＊	
	Clear buffer(s)	○	
ESC FF	Print data in page mode	＊	
ESC SP	Set right-side character spacing		○
ESC !	Select print mode(s)		○
ESC $	Set absolute print position	○	
ESC %	Select/cancel user-defined character set		○
ESC &	Define user-defined characters		○
ESC ＊	Select bit-image mode	○	
ESC -	Turn underline mode on/off		○
ESC 2	Select default line spacing		○
ESC 3	Set line spacing		○
ESC <	Return home	○	
ESC =	Select peripheral device		○
ESC ?	Cancel user-defined characters		○
ESC @	Initialize printer	○	○
ESC C	Set slip paper eject length		○

Command	Name	Command Classification	
		Executing	Setting
ESC D	Set horizontal tab positions		○
ESC E	Turn emphasized mode on/off		○
ESC F	Set/cancel slip paper reverse eject		○
ESC G	Turn double-strike mode on/off		○
ESC J	Print and feed paper	○	
ESC K	Print and reverse feed	○	
ESC L	Select page mode	*	
ESC M	Select character font		○
ESC R	Select an international character set		○
ESC S	Select standard mode	*	
ESC T	Select print direction in page mode		*
ESC U	Turn unidirectional printing mode on/off		○
ESC V	Turn 90° clockwise rotation mode on/off		*
ESC W	Set printing area in page mode		*
**ESC **	Set relative print position	○	
ESC a	Select justification		○
ESC c 3	Select paper sensor(s) to output paper-end signals		○
ESC c 4	Select paper sensor(s) to stop printing		○
ESC c 5	Enable/disable panel buttons		○
ESC d	Print and feed ***n*** lines	○	
ESC e	Print and reverse feed ***n*** lines	○	
ESC f	Set slip paper wait time		○
ESC p	General pulse	○	
ESC q	Release	○	
ESC t	Select character code table		○
ESC {	Turn upside-down printing mode on/off		○

NOTE: NV = non-volatile

Command	Name	Command Classification	
		Executing	Setting
GS !	Select character size		○
GS $	Set absolute vertical print position in page mode	*	
GS *	Define user-defined bit image		○
GS (A	Execute test print	○	
GS /	Print user-defined bit image	○	
GS I	Transmit printer ID	○	
GS L	Set left margin		○
GS P	Set horizontal and vertical motion units		○
GS W	Set printing area width		○
**GS **	Set relative vertical print position in page mode	*	
GS a	Enable/disable Automatic Status Back (ASB)	○	○
GS r	Transmit status	○	

Kanji command list (when the Japanese, Simplified Chinese, or Traditional Chinese model is used)

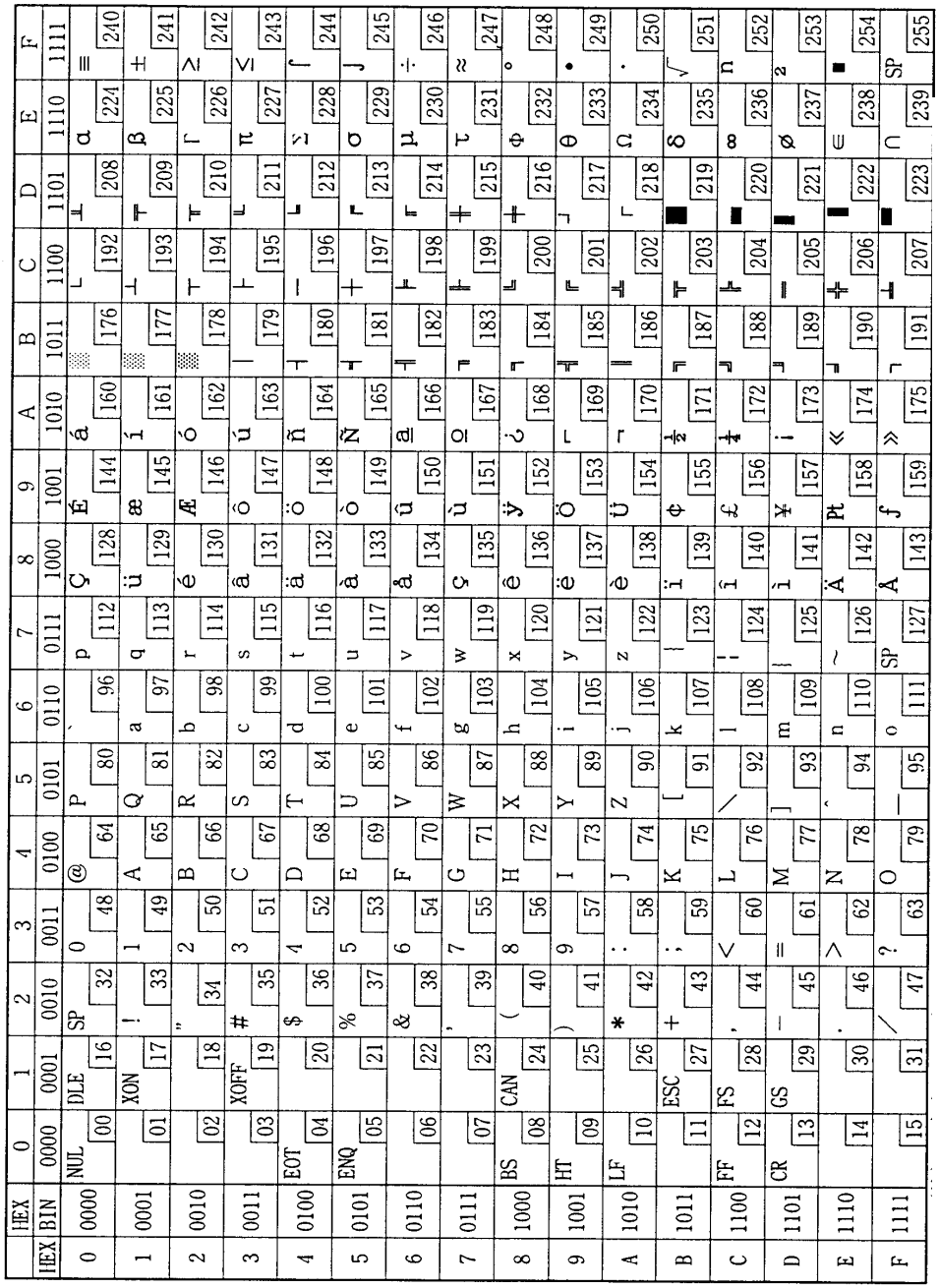
Command	Name	Command Classification	
		Executing	Setting
FS !	Set print mode(s) for Kanji characters		○
FS &	Select Kanji character mode		○
FS -	Turn underline mode on/off for Kanji characters		○
FS .	Cancel Kanji character mode		○
FS 2	Define user-defined Kanji characters		○
FS C	Select Kanji character code system		○
FS S	Set left- and right-side Kanji character spacing		○
FS W	Turn quadruple-size mode on/off for Kanji characters		○

<Fundamental calculation pitch>

The fundamental calculation pitch is used to set the minimum pitch by software instead of by mechanical pitch. Using the fundamental calculation pitch minimizes dependence on the mechanical pitch for setting, e.g., the paper feed amount, and enables the printing position to be set in inches. (Refer to **GS P**.)

3.2 Character Code Tables

3.2.1 Page 0 (PC437: USA, Standard Europe) (International Character Set: U.S.A.)



HEX / BIN	0 0000	1 0001	2 0010	3 0011	4 0100	5 0101	6 0110	7 0111	8 1000	9 1001	A 1010	B 1011	C 1100	D 1101	E 1110	F 1111
0 0000	NUL 00	DLE 16	SP 32	0 48	@ 64	P 80	` 96	p 112	Ç 128	É 144	á 160	▒ 176	└ 192	┴ 208	α 224	≡ 240
1 0001	XON 17	! 33	1 49	A 65	Q 81	a 97	q 113	ü 129	æ 145	í 161	▒ 177	┴ 193	┬ 209	ß 225	± 241
2 0010	" 34	2 50	B 66	R 82	b 98	r 114	é 130	Æ 146	ô 147	ó 162	▒ 178	├ 194	╥ 210	Γ 226	≥ 242
3 0011	XOFF 19	# 35	3 51	C 83	c 99	s 115	â 131	ö 148	ñ 164	ú 163	│ 179	┤ 195	╙ 211	π 227	≤ 243
4 0100	EOT 04	$ 36	4 52	D 68	t 100	T 84	ä 132	ò 149	Ñ 165	ñ 164	┤ 180	─ 196	╘ 212	Σ 228	⌠ 244
5 0101	ENQ 05	% 37	5 53	E 69	U 85	e 101	u 117	à 133	ò 149	Ñ 165	╡ 181	┼ 197	╒ 213	σ 229	⌡ 245
6 0110	06	& 38	6 54	F 70	V 86	f 102	v 118	å 134	û 150	ª 166	╢ 182	╞ 198	╓ 214	µ 230	÷ 246
7 0111	07	' 39	7 55	G 71	W 87	g 103	w 119	ç 135	ù 151	º 167	╖ 183	╟ 199	╫ 215	τ 231	≈ 247
8 1000	BS 08	CAN 24	(40	8 56	H 72	X 88	h 104	x 120	ê 136	ÿ 152	¿ 168	╕ 184	╚ 200	Φ 232	° 248
9 1001	HT 09	) 41	9 57	I 73	Y 89	i 105	y 121	ë 137	Ö 153	⌐ 169	╣ 185	╔ 201	┘ 217	Θ 233	• 249
A 1010	LF 10	* 42	: 58	J 74	Z 90	j 106	z 122	è 138	Ü 154	¬ 170	║ 186	╩ 202	┌ 218	Ω 234	· 250
B 1011	ESC 11	+ 43	; 59	K 75	[91	k 107	{ 123	ï 139	¢ 155	½ 171	╗ 187	╦ 203	▉ 219	δ 235	√ 251
C 1100	FS 12	, 44	< 60	L 76	\ 92	l 108	¦ 124	î 140	£ 156	¼ 172	╝ 188	╠ 204	▌ 220	∞ 236	n 252
D 1101	GS 13	- 45	= 61	M 77	] 93	m 109	} 125	ì 141	¥ 157	¡ 173	╜ 189	═ 205	▐ 221	ø 237	2 253
E 1110	14	. 46	> 62	N 78	^ 94	n 110	~ 126	Ä 142	₧ 158	« 174	╛ 190	╬ 206	▬ 222	∈ 238	■ 254
F 1111	15	/ 47	? 63	O 79	_ 95	o 111	SP 127	Å 143	ƒ 159	» 175	┐ 191	╧ 207	▄ 223	∩ 239	SP 255

NOTE: The character code tables show only character configurations. They do not show the actual print pattern.

3.2.2 Page 1 (Katakana)

	HEX	8	9	A	B	C	D	E	F
HEX	BIN	1000	1001	1010	1011	1100	1101	1110	1111
0	0000	ー 128	丄 144	SP 160	ー 176	タ 192	ミ 208	二 224	× 240
1	0001	▬ 129	丅 145	。 161	ア 177	チ 193	ム 209	卜 225	円 241
2	0010	▬ 130	十 146	「 162	イ 178	ツ 194	メ 210	丰 226	年 242
3	0011	▬ 131	卜 147	」 163	ウ 179	テ 195	モ 211	刊 227	月 243
4	0100	■ 132	一 148	、 164	エ 180	ト 196	ヤ 212	◢ 228	日 244
5	0101	■ 133	ー 149	・ 165	オ 181	ナ 197	ユ 213	◣ 229	時 245
6	0110	■ 134	丨 150	ヲ 166	カ 182	ニ 198	ヨ 214	◥ 230	分 246
7	0111	■ 135	丨 151	ァ 167	キ 183	ヌ 199	ラ 215	◤ 231	秒 247
8	1000	▏ 136	「 152	ィ 168	ク 184	ネ 200	リ 216	♠ 232	〒 248
9	1001	▏ 137	ㄱ 153	ゥ 169	ケ 185	ノ 201	ル 217	♥ 233	市 249
A	1010	▏ 138	ㄴ 154	ェ 170	コ 186	ハ 202	レ 218	✦ 234	区 250
B	1011	▏ 139	ㄱ 155	ォ 171	サ 187	ヒ 203	ロ 219	♣ 235	町 251
C	1100	▏ 140	ㄑ 156	ャ 172	シ 188	フ 204	ワ 220	● 236	村 252
D	1101	▏ 141	ㄴ 157	ュ 173	ス 189	ヘ 205	ン 221	○ 237	人 253
E	1110	▏ 142	ㄴ 158	ョ 174	セ 190	ホ 206	゛ 222	／ 238	▒ 254
F	1111	┼ 143	ノ 159	ッ 175	ソ 191	マ 207	゜ 223	＼ 239	SP 255

3.2.3 Page 2 (PC850: Multilingual)

HEX	BIN	8	9	A	B	C	D	E	F
		1000	1001	1010	1011	1100	1101	1110	1111
0	0000	Ç 128	É 144	á 160	▒ 176	└ 192	ð 208	Ó 224	— 240
1	0001	ü 129	æ 145	í 161	▒ 177	┴ 193	Ð 209	ß 225	± 241
2	0010	é 130	Æ 146	ó 162	▒ 178	┬ 194	Ê 210	Ô 226	‗ 242
3	0011	â 131	ô 147	ú 163	│ 179	├ 195	Ë 211	Ò 227	¾ 243
4	0100	ä 132	ö 148	ñ 164	┤ 180	─ 196	È 212	õ 228	¶ 244
5	0101	à 133	ò 149	Ñ 165	Á 181	┼ 197	ı 213	Õ 229	§ 245
6	0110	å 134	û 150	ª 166	Â 182	ã 198	Í 214	µ 230	÷ 246
7	0111	ç 135	ù 151	º 167	À 183	Ã 199	Î 215	þ 231	¸ 247
8	1000	ê 136	ÿ 152	¿ 168	© 184	╚ 200	Ï 216	Þ 232	° 248
9	1001	ë 137	Ö 153	® 169	╣ 185	╔ 201	┘ 217	Ú 233	¨ 249
A	1010	è 138	Ü 154	¬ 170	║ 186	╩ 202	┌ 218	Û 234	· 250
B	1011	ï 139	ø 155	½ 171	╗ 187	╦ 203	■ 219	Ù 235	¹ 251
C	1100	î 140	£ 156	¼ 172	╝ 188	╠ 204	▄ 220	ý 236	³ 252
D	1101	ì 141	Ø 157	¡ 173	¢ 189	═ 205	¦ 221	Ý 237	² 253
E	1110	Ä 142	× 158	« 174	¥ 190	╬ 206	Ì 222	¯ 238	▪ 254
F	1111	Å 143	ƒ 159	» 175	┐ 191	¤ 207	▀ 223	´ 239	SP 255

3.2.4 Page 3 (PC860: Portuguese)

HEX	BIN	8	9	A	B	C	D	E	F
		1000	1001	1010	1011	1100	1101	1110	1111
0	0000	Ç 128	É 144	á 160	▒ 176	└ 192	╨ 208	α 224	≡ 240
1	0001	ü 129	À 145	í 161	▒ 177	┴ 193	╤ 209	ß 225	± 241
2	0010	é 130	È 146	ó 162	▒ 178	┬ 194	╥ 210	Γ 226	≥ 243
3	0011	â 131	ô 147	ú 163	│ 179	├ 195	╙ 211	π 227	≤ 243
4	0100	ã 132	õ 148	ñ 164	┤ 180	─ 196	╘ 212	Σ 228	⌠ 244
5	0101	à 133	ò 149	Ñ 165	╡ 181	┼ 197	╒ 213	σ 229	⌡ 245
6	0110	Á 134	Ú 150	ª 166	╢ 182	╞ 198	╓ 214	µ 230	÷ 246
7	0111	ç 135	ù 151	º 167	╖ 183	╟ 199	╫ 215	τ 231	≈ 247
8	1000	ê 136	Ì 152	¿ 168	╕ 184	╚ 200	╪ 216	Φ 232	° 248
9	1001	Ê 137	Õ 153	⌐ 169	╣ 185	╔ 201	┘ 217	Θ 233	• 249
A	1010	è 138	Ü 154	¬ 170	║ 186	╩ 202	┌ 218	Ω 234	· 250
B	1011	Í 139	¢ 155	½ 171	╗ 187	╦ 203	■ 219	δ 235	√ 251
C	1100	Ô 140	£ 156	¼ 172	╝ 188	╠ 204	▄ 220	∞ 236	n 252
D	1101	ì 141	Ù 157	¡ 173	╜ 189	═ 205	▌ 221	ø 237	² 253
E	1110	Ã 142	₧ 158	« 174	╛ 190	╬ 206	▐ 222	∈ 238	■ 254
F	1111	Â 143	Ó 159	» 175	┐ 191	╧ 207	▀ 223	∩ 239	SP 255

3.2.5 Page 4 (PC863: Canadian-French)

	HEX	8	9	A	B	C	D	E	F
HEX	BIN	1000	1001	1010	1011	1100	1101	1110	1111
0	0000	Ç 128	É 144	¦ 160	▒ 176	└ 192	╨ 208	α 224	≡ 240
1	0001	ü 129	È 145	´ 161	▒ 177	┴ 193	╤ 209	ß 225	± 241
2	0010	é 130	Ê 146	ó 162	▒ 178	┬ 194	╥ 210	Γ 226	≥ 242
3	0011	â 131	ô 147	ú 163	| 179	├ 195	╙ 211	π 227	≤ 243
4	0100	Â 132	Ë 148	¨ 164	┤ 180	─ 196	╘ 212	Σ 228	⌠ 244
5	0101	à 133	Ï 149	¸ 165	╡ 181	┼ 197	╒ 213	σ 229	⌡ 245
6	0110	¶ 134	û 150	ª 166	╢ 182	╞ 198	╓ 214	µ 230	÷ 246
7	0111	ç 135	ù 151	¯ 167	╖ 183	╟ 199	╫ 215	τ 231	≈ 247
8	1000	ê 136	¤ 152	Î 168	╕ 184	╚ 200	╪ 216	Φ 232	° 248
9	1001	ë 137	Ô 153	⌐ 169	╣ 185	╔ 201	┘ 217	Θ 233	• 249
A	1010	è 138	Ü 154	¬ 170	║ 186	╩ 202	┌ 218	Ω 234	· 250
B	1011	ï 139	¢ 155	½ 171	╗ 187	╦ 203	■ 219	δ 235	√ 251
C	1100	î 140	£ 156	¼ 172	╝ 188	╠ 204	▬ 220	∞ 236	n 252
D	1101	‗ 141	Ù 157	¾ 173	╜ 189	═ 205	▌ 221	ø 237	² 253
E	1110	À 142	Û 158	« 174	╛ 190	╬ 206	▐ 222	∈ 238	■ 254
F	1111	§ 143	ƒ 159	» 175	┐ 191	╧ 207	▀ 223	∩ 239	SP 255

3.2.6 Page 5 (PC865: Nordic)

	HEX	8	9	A	B	C	D	E	F
HEX	BIN	1000	1001	1010	1011	1100	1101	1110	1111
0	0000	Ç 128	É 144	á 160	▒ 176	└ 192	╨ 208	α 224	≡ 240
1	0001	ü 129	æ 145	í 161	▒ 177	┴ 193	╤ 209	ß 225	± 241
2	0010	é 130	Æ 146	ó 162	▒ 178	┬ 194	╥ 210	Γ 226	≥ 242
3	0011	â 131	ô 147	ú 163	│ 179	├ 195	╙ 211	π 227	≤ 243
4	0100	ä 132	ö 148	ñ 164	┤ 180	─ 196	╘ 212	Σ 228	⌠ 244
5	0101	à 133	ò 149	Ñ 165	╡ 181	┼ 197	╒ 213	σ 229	⌡ 245
6	0110	å 134	û 150	ª 166	╢ 182	╞ 198	╓ 214	µ 230	÷ 246
7	0111	ç 135	ù 151	º 167	╖ 183	╟ 199	╫ 215	τ 231	≈ 247
8	1000	ê 136	ÿ 152	¿ 168	╕ 184	╚ 200	╪ 216	Φ 232	° 248
9	1001	ë 137	Ö 153	⌐ 169	╣ 185	╔ 201	┘ 217	Θ 233	• 249
A	1010	è 138	Ü 154	¬ 170	║ 186	╩ 202	┌ 218	Ω 234	· 250
B	1011	ï 139	ø 155	½ 171	╗ 187	╦ 203	▉ 219	δ 235	√ 251
C	1100	î 140	£ 156	¼ 172	╝ 188	╠ 204	▄ 220	∞ 236	n 252
D	1101	ì 141	Ø 157	¡ 173	╜ 189	═ 205	▌ 221	ø 237	² 253
E	1110	Ä 142	₧ 158	« 174	╛ 190	╬ 206	▐ 222	∈ 238	■ 254
F	1111	Å 143	ƒ 159	¤ 175	┐ 191	╧ 207	▀ 223	∩ 239	SP 255

3.2.7 Page 6 (Hiragana) (Available on Japanese model)

	HEX	8	9	A	B	C	D	E	F
HEX	BIN	1000	1001	1010	1011	1100	1101	1110	1111
0	0000	礎 128	本 144	SP 160	ー 176	た 192	み 208	過 224	換 240
1	0001	129	145	。 161	あ 177	ち 193	む 209	225	241
2	0010	除 130	荷 146	「 162	い 178	つ 194	め 210	足 226	攻 242
3	0011	131	147	」 163	う 179	て 195	も 211	227	243
4	0100	定 132	特 148	、 164	え 180	と 196	や 212	利 228	産 244
5	0101	133	149	・ 165	お 181	な 197	ゆ 213	229	245
6	0110	信 134	越 150	を 166	か 182	に 198	よ 214	用 230	打 246
7	0111	135	151	ぁ 167	き 183	ぬ 199	ら 215	231	247
8	1000	緑 136	他 152	ぃ 168	く 184	ね 200	り 216	移 232	納 248
9	1001	137	153	ぅ 169	け 185	の 201	る 217	233	249
A	1010	科 138	社 154	ぇ 170	こ 186	は 202	れ 218	下 234	変 250
B	1011	139	155	ぉ 171	さ 187	ひ 203	ろ 219	235	251
C	1100	目 140	瓶 156	ゃ 172	し 188	ふ 204	わ 220	加 236	誂 252
D	1101	141	157	ゅ 173	す 189	へ 205	ん 221	237	253
E	1110	々 142	奉 158	ょ 174	せ 190	ほ 206	゛ 222	解 238	件 254
F	1111	143	159	っ 175	そ 191	ま 207	゜ 223	239	255

3.2.8 Page 7 (One-pass printing Kanji characters)
(Available on Japanese model)

	HEX	8	9	A	B	C	D	E	F
HEX	BIN	1000	1001	1010	1011	1100	1101	1110	1111
0	0000	日 128	会 144	水 160	受 176	点 192	課 208	買 224	非 240
1	0001	129	145	161	177	193	209	225	241
2	0010	扱 130	客 146	木 162	前 178	中 194	証 210	号 226	承 242
3	0011	131	147	163	179	195	211	227	243
4	0100	外 132	券 148	土 164	残 180	内 196	組 212	有 228	送 244
5	0101	133	149	165	181	197	213	229	245
6	0110	額 134	回 150	振 166	止 182	部 198	店 214	期 230	― 246
7	0111	135	151	167	183	199	215	231	247
8	1000	割 136	在 152	数 168	純 184	別 200	認 216	限 232	棄 248
9	1001	137	153	169	185	201	217	233	249
A	1010	検 138	算 154	精 170	替 186	戻 202	廃 218	頭 234	累 250
B	1011	139	155	171	187	203	219	235	251
C	1100	高 140	上 156	銭 172	代 188	門 204	両 220	差 236	違 252
D	1101	141	157	173	189	205	221	237	253
E	1110	価 142	火 158	総 174	値 190	料 206	効 222	括 238	番 254
F	1111	143	159	175	191	207	223	239	255

3.2.9 Page 8 (One-pass printing Kanji characters)
(Available on Japanese model)

	HEX	8	9	A	B	C	D	E	F
HEX	BIN	1000	1001	1010	1011	1100	1101	1110	1111
0	0000	訂 128	計 144	払 160	売 176	名 192	次 208	万 224	室 240
1	0001	129	145	161	177	193	209	225	241
2	0010	正 130	小 146	掛 162	取 178	個 194	不 210	責 226	商 242
3	0011	131	147	163	179	195	211	227	243
4	0100	品 132	金 148	入 164	係 180	領 196	枚 212	終 228	人 244
5	0101	133	149	165	181	197	213	229	245
6	0110	円 134	現 150	貸 166	未 182	収 198	誤 214	了 230	大 246
7	0111	135	151	167	183	199	215	231	247
8	1000	種 136	釣 152	出 168	消 184	予 200	休 216	免 232	安 248
9	1001	137	153	169	185	201	217	233	249
A	1010	担 138	預 154	支 170	費 186	約 202	契 218	伝 234	仕 250
B	1011	139	155	171	187	203	219	235	251
C	1100	当 140	税 156	単 172	年 188	込 204	開 220	自 236	控 252
D	1101	141	157	173	189	205	221	237	253
E	1110	合 142	引 158	返 174	月 190	明 206	閉 222	設 238	基 254
F	1111	143	159	175	191	207	223	239	255

3.2.10 Page19 (PC858: Euro)

HEX	BIN	8	9	A	B	C	D	E	F
		1000	1001	1010	1011	1100	1101	1110	1111
0	0000	Ç 128	É 144	á 160	▒ 176	└ 192	ð 208	Ó 224	— 240
1	0001	ü 129	æ 145	í 161	▒ 177	┴ 193	Ð 209	ß 225	± 241
2	0010	é 130	Æ 146	ó 162	▒ 178	┬ 194	Ê 210	Ô 226	‗ 242
3	0011	â 131	ô 147	ú 163	│ 179	├ 195	Ë 211	Ò 227	¾ 243
4	0100	ä 132	ö 148	ñ 164	┤ 180	─ 196	È 212	õ 228	¶ 244
5	0101	à 133	ò 149	Ñ 165	Á 181	┼ 197	€ 213	Õ 229	§ 245
6	0110	å 134	û 150	ª 166	Â 182	ã 198	Í 214	µ 230	÷ 246
7	0111	ç 135	ù 151	º 167	À 183	Ã 199	Î 215	þ 231	¸ 247
8	1000	ê 136	ÿ 152	¿ 168	© 184	╚ 200	Ï 216	Þ 232	° 248
9	1001	ë 137	Ö 153	® 169	╣ 185	╔ 201	┘ 217	Ú 233	¨ 249
A	1010	è 138	Ü 154	¬ 170	║ 186	╩ 202	┌ 218	Û 234	· 250
B	1011	ï 139	ø 155	½ 171	╗ 187	╦ 203	■ 219	Ù 235	¹ 251
C	1100	î 140	£ 156	¼ 172	╝ 188	╠ 204	▬ 220	ý 236	³ 252
D	1101	ì 141	Ø 157	¡ 173	¢ 189	═ 205	¦ 221	Ý 237	² 253
E	1110	Ä 142	× 158	« 174	¥ 190	╬ 206	Ì 222	¯ 238	■ 254
F	1111	Å 143	ƒ 159	» 175	┐ 191	¤ 207	▬ 223	´ 239	SP 255

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3.2.11 Page 20 (Thai Character Code 42)

	8	9	A	B	C	D	E	F
0	┌	๐		ฒ	ย	เ	่	๊
1	┐	๑	ก	ณ	ร	แ	้	๋
2	└	๒	ข	ด	ฤ	โ	๊	์
3	┘	๓	ค	ต	ล	ใ	๋	่
4	│	๔	ฆ	ถ	ว	ไ	์	้
5	─	๕	ง	ท	ศ	ๆ	·	๊
6	├	๖	จ	ธ	ษ	ฯ	่ํ	๋
7	┤	๗	ฉ	น	ส	ั	้ํ	่
8	┴	๘	ช	บ	ห	ั	๊ํ	้
9	┬	๙	ซ	ป	ฬ	ิ	๋ํ	๊
A	┼	ข	ฌ	ผ	อ	ี	ั่	๋
B	█	ฅ	ญ	ฝ	ฮ	ึ	ั้	่
C	←	ุ	ฎ	พ	ะ	ื	ั๊	้
D	↑	ู	ฏ	ฟ	ฦ	ั	ั๋	๊
E	→	ฺ	ฐ	ภ	า	ํ	่	๋
F	↓	เ	ฑ	ม	ำ	็	้	

3.2.12 Page 21 (Thai Character Code 11)

	8	9	A	B	C	D	E	F
0	◌ั	◌็	เ	๋	ภ	ะ	ๅ	๐
1	◌ั◌	◌็◌	ก	์	ม	◌	แ	๑
2	◌ั◌◌	◌็◌◌	ข	๎	ย	า	โ	๒
3	◌ั◌◌◌	◌็◌◌◌	ฃ	๏	ร	ำ	ใ	๓
4	◌ิ	◌่	ค	ด	ฤ	◌	ไ	๔
5	◌ิ◌	◌่◌	ฅ	ต	ล	◌	ๆ	๕
6	◌ิ◌◌	◌่◌◌	ฆ	ถ	ฦ	◌	ๆ	๖
7	◌ิ◌◌◌	◌่◌◌◌	ง	ท	ว	◌	๘	๗
8	◌ี	◌้	จ	ธ	ศ	◌	๎	๘
9	◌ี◌	◌้◌	ฉ	น	ษ	◌	◌	๙
A	◌ี◌◌	◌้◌◌	ช	บ	ส	◌	◌	๚
B	◌ี◌◌◌	◌้◌◌◌	ซ	ป	ห	–	+	๛
C	◌ึ	◌๊	ฌ	ผ	ฬ	⊥	◌	◌
D	◌ึ◌	◌๊◌	ญ	ฝ	อ	⊤	◌	๑
E	◌ึ◌◌	◌๊◌◌	ฎ	พ	ฮ	┼	◌	๑
F	◌ึ◌◌◌	◌๊◌◌◌	ฏ	ฟ	ฯ	฿	◌	

3.2.13 Page 22 (Thai Character Code 13)

	8	9	A	B	C	D	E	F
0		◌ั		ฐ	ภ	๐	เ	๐
1	◌ั	◌ั	ก	ฑ	ม	๑	แ	๑
2	◌ั	◌ั	ข	ฒ	ย	๒	โ	๒
3	◌ั	◌ั	ฃ	ณ	ร	๓	ใ	๓
4	◌ั		ค	ด	ฤ	๔	ไ	๔
5		◌ั	ฅ	ต	ล	๕	ๅ	๕
6	◌ั	◌ั	ฆ	ถ	ฦ	๖	ๆ	๖
7	◌ั	◌ั	ง	ท	ว	๗	๗	๗
8	◌ั	◌ั	จ	ธ	ศ	๘	◌	๘
9	◌ั		ฉ	น	ษ	๙	◌	๙
A		◌ั	ช	บ	ส	◌	◌	ฯ
B	◌ั	◌ั	ซ	ป	ห	๛	+	๚
C	◌ั	◌ั	ฌ	ผ	ฬ	๑	◌	←
D	◌ั	◌ั	ญ	ฝ	อ	๙	๐	↑
E	◌ั		ฎ	พ	ฮ	เ	◌	→
F	◌ั		ฏ	ฟ	ฯ	฿	๐	↓

3.2.14 Page 23 (Thai Character Code 14)

	8	9	A	B	C	D	E	F
0	ๅ	๙		ฐ	ภ	ๆ	เ	๐
1	ๆ	๑	ก	ฑ	ม	็	แ	๑
2	็	๒	ข	ฒ	ย	่	โ	๒
3	่	๓	ฃ	ณ	ร	้	ใ	๓
4	้	๔	ค	ด	ฤ	๊	ไ	๔
5	๊	๕	ฅ	ต	ล	๋	ๅ	๕
6	๋	๖	ฆ	ถ	ฦ	์	ๆ	๖
7	์	๗	ง	ท	ว	ํ	๗	๗
8	ํ	๘	จ	ธ	ศ	๎	๘	๘
9	๎	๙	ฉ	น	ษ	๏	๙	๙
A	๏	๚	ช	บ	ส	๐	๚	๚
B	■	๛	ซ	ป	ห	๑	๛	๛
C	๐	๜	ฌ	ผ	ฬ	๒	๜	๜
D	๑	๝	ญ	ฝ	อ	๓	๝	๝
E	๒	๞	ฎ	พ	ฮ	๔	๞	๞
F	๓	๟	ฏ	ฟ	ฯ	฿	๟	๟

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3.2.15 Page 24 (Thai Character Code 16)

	8	9	A	B	C	D	E	F
0	┌	โ		ฐ	ภ	ะ	เ	๐
1	┐	ใ	ก	ฑ	ม	ั	แ	๑
2	└	ั่	ข	ฒ	ย	า	[illegible]	๒
3	┘	ั้	ฃ	ณ	ร	ำ	[illegible]	๓
4	│	ั๊	ค	ด	ฤ	ิ	[illegible]	๔
5	─	ั๋	ฅ	ต	ล	ี	ๅ	๕
6	├	ิ่	ฆ	ถ	ฦ	ึ	ๆ	๖
7	┤	ิ้	ง	ท	ว	ื	็	๗
8	┴	ิ๊	จ	ธ	ศ	ุ	่	๘
9	┬	ิ๋	ฉ	น	ษ	ู	้	๙
A	┼	ิ์	ช	บ	ส	ฺ	๊	๚
B	█	ี่	ซ	ป	ห	ึ่	๋	ื่
C	←	ี้	ฌ	ผ	ฬ	ึ้	์	ื้
D	↑	ี๊	ญ	ฝ	อ	ึ๊	ํ	ื๊
E	→	ี๋	ฎ	พ	ฮ	ึ๋	ไ	ื๋
F	↓	เ	ฏ	ฟ	ฯ	฿	๏	

3.2.16 Page 25 (Thai Character Code 17)

	8	9	A	B	C	D	E	F
0	◌ั	◌็		ฐ	ภ	ะ	เ	๐
1	◌ะ	◌่	ก	ฑ	ม	◌	แ	๑
2	◌า	◌้	ข	ฒ	ย	า	โ	๒
3	◌ำ	◌๊	ฃ	ณ	ร	ำ	ใ	๓
4	◌ิ	◌๋	ค	ด	ฤ	◌	ไ	๔
5	◌ี	◌์	ฅ	ต	ล	◌	ๅ	๕
6	◌ึ	◌	ฆ	ถ	ฦ	◌	ๆ	๖
7	◌ื	◌	ง	ท	ว	◌	๗	๗
8	◌ุ	◌	จ	ธ	ศ	◌	◌	๘
9	◌ู	◌	ฉ	น	ษ	◌	◌	๙
A	◌ฺ	◌	ช	บ	ส	◌	◌	ฯ
B	◌฿	◌	ซ	ป	ห	◌	◌	๛
C	◌เ	◌	ฌ	ผ	ฬ	๑	◌	←
D	◌แ	◌	ญ	ฝ	อ	๓	◌	↑
E	◌โ	◌	ฎ	พ	ฮ	เ	◌	→
F	◌ใ	◌	ฏ	ฟ	ฯ	฿	๐	↓

3.2.17 Page 26 (Thai Character Code 18)

	8	9	A	B	C	D	E	F
0	ร	◌๙		ฐ	ภ	๙	เ	๐
1	ล	◌๑	ก	ฑ	ม	◌๙	แ	๑
2	ว	◌๘	ข	ฒ	ย	า	โ	๒
3	ศ	◌๗	ฃ	ณ	ร	ำ	ใ	๓
4	ษ	◌๖	ค	ด	ฤ	◌๑	ไ	๔
5	ส	◌๕	ฅ	ต	ล	◌๒	ๅ	๕
6	ห	◌๔	ฆ	ถ	ฦ	◌๓	ๆ	๖
7	ฬ	◌๓	ง	ท	ว	◌๔	๘	๗
8	อ	◌๒	จ	ธ	ศ	◌๐	◌	๘
9	ฮ	◌๑	ฉ	น	ษ	◌๙	◌๙	๙
A	ฯ	◌๐	ช	บ	ส	◌	◌๗	๏
B	◼	◌๙	ซ	ป	ห	◌๘	◌๐	◌๘
C	←	◌๘	ฌ	ผ	ฬ	◌๗	◌๘	◌๗
D	↑	◌๗	ญ	ฝ	อ	◌๖	◌๐	◌๖
E	→	◌๖	ฎ	พ	ฮ	◌๕	◌๖	◌๕
F	↓	เ	ฏ	ฟ	ฯ	฿	◌๐	

3.2.18 Page 255 (Space Page)

In the space page (page 255), the following font is defined as the default.

7 × 7 font (only when font 7 × 9 is selected. When 9 × 9 font is selected, character codes 80H to FFH are all spaces.)

	HEX	8	9	A	B	C	D	E	F
HEX	BIN	1000	1001	1010	1011	1100	1101	1110	1111
0	0000	128	Õ 144	160	0 176	@ 192	P 208	. 224	p 240
1	0001	δ 129	µ 145	¡ 161	1 177	A 193	Q 209	a 225	q 241
2	0010	Ð 130	Þ 146	" 162	2 178	B 194	R 210	b 226	r 242
3	0011	Ê 131	Þ 147	# 163	3 179	C 195	S 211	c 227	s 243
4	0100	Ë 132	Ú 148	$ 164	4 180	D 196	T 212	d 228	t 244
5	0101	È 133	Û 149	% 165	5 181	E 197	U 213	e 229	u 245
6	0110	Í 134	Ù 150	& 166	6 182	F 198	V 214	f 230	v 246
7	0111	Î 135	ý 151	' 167	7 183	G 199	W 215	g 231	w 247
8	1000	Ï 136	Ý 152	(168	8 184	H 200	X 216	h 232	x 248
9	1001	Ì 137	± 153	) 169	9 185	I 201	Y 217	i 233	y 249
A	1010	Ó 138	÷ 154	* 170	: 186	J 202	Z 218	j 234	z 250
B	1011	ß 139	· 155	+ 171	; 187	K 203	[219	k 235	{ 251
C	1100	Ô 140	156	, 172	< 188	L 204	\ 220	l 236	| 252
D	1101	Ò 141	157	− 173	= 189	M 205	] 221	m 237	} 253
E	1110	142	158	. 174	> 190	N 206	^ 222	n 238	~ 254
F	1111	õ 143	159	/ 175	? 191	O 207	_ 223	o 239	. 255

3.2.19 International Character Set

Country	ASCII code (Hex)											
	23	24	40	5B	5C	5D	5E	60	7B	7C	7D	7E
U.S.A	#	$	@	[	\	]	^	`	{	|	}	~
France	#	$	à	°	ç	§	^	`	é	ù	è	¨
Germany	#	$	§	Ä	Ö	Ü	^	`	ä	ö	ü	ß
U.K.	£	$	@	[	\	]	^	`	{	|	}	~
Denmark I	#	$	@	Æ	Ø	Å	^	`	æ	ø	å	~
Sweden	#	¤	É	Ä	Ö	Å	Ü	é	ä	ö	å	ü
Italy	#	$	@	°	\	é	^	ù	à	ò	è	ì
Spain I	Pt	$	@	¡	Ñ	¿	^	`	¨	ñ	}	~
Japan	#	$	@	[	¥	]	^	`	{	|	}	~
Norway	#	¤	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü
Denmark II	#	$	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü
Spain II	#	$	á	¡	Ñ	¿	é	`	í	ñ	ó	ú
Latin America	#	$	á	¡	Ñ	¿	é	ü	í	ñ	ó	ú
Korea	#	$	@	[	₩	]	^	`	{	|	}	~

3.3 Switches and Buttons

3.3.1 Power Button

The power button (a rocker switch) located on the lower left front of the printer turns the power on or off. Turn on the power only after connecting the power supply.

3.3.2 Panel Buttons

All the panel buttons are disabled by **ESC c 5**.

1) RELEASE button (non-locking push button)

[Function] Release paper

2) REVERSE button (non-locking push button)

[Function] Reverse paper feeding for the line spacing set by **ESC 2** and **ESC 3**

3) FORWARD button (non-locking push button)

[Function] Feed paper for the line spacing set by **ESC 2** and **ESC 3**
Paper feed is not executed without paper.
When the printer cover is open, the REVERSE/FORWARD buttons will not operate.

3.3.3 DIP Switches

3.3.3.1 Serial interface specification

1) DIP switch 1: 8 switches

Table 3.3.1 DIP Switch 1

SW 1	Function	ON	OFF
1	Data receive error	Ignored	Prints '?'
2	Receive buffer capacity	69 bytes	4K bytes
3	Handshaking	XON/XOFF	DTR/DSR
4	Word length	7 bits	8 bits
5	Parity check	Yes	No
6	Parity selection	Even	Odd
7	Transmission speed selection.	Refer to Table 3.3.2	
8			

Table 3.3.2 Transmission Speed

Transmission Speed (bps)	SW 1-7	SW 1-8
2400	ON	ON
4800	OFF	ON
9600	ON	OFF
19200	OFF	OFF

bps: bits per second

2) DIP switch 2: 8 switches

Table 3.3.3 DIP Switch 2

SW 2	Function	ON	OFF
1	Handshaking (BUSY condition)	Receive buffer full	Offline or receive buffer full
2	Customer display (DM-D) connection	Connected	Not connected
3	Undefined	--	--
4			
5	Internal use		Fixed to Off
6	Internal use		Fixed to Off
7	I/F pin 6 reset signal (*1)	Enabled	Disabled
8	IF pin 25 reset signal (*2)	Enabled	Disabled

(*1)(*2) With the RS-485 serial interface specification (dealer option), the DIP switches 2-7 and 2-8 are disabled.

NOTES:
- Changes in DIP switch settings (excluding switches 2-7 and 2-8 interface reset signals) are recognized only when the printer power is turned on or when the printer is reset by using the interface. If the DIP switch setting is changed after the printer power is turned on, the change does not take effect until the printer is turned on again or is reset.
- If you turn on DIP switch 2-7 or 2-8 while the printer power is turned on, the printer may be reset, depending on the signal state. DIP switches should not be changed while the printer power is on.

3.3.3.2 Parallel interface specification

Table 3.3.4 DIP Switch 1

SW	Function	ON	OFF
1	Automatic line feed	Always enabled	Always disabled
2	Receive buffer capacity	69 bytes	4K bytes
3-8	Undefined	---	---

Table 3.3.5 DIP Switch 2

SW	Function	ON	OFF
1	Handshaking (BUSY condition)	•Receive buffer full •Reading data	•Offline •Receive buffer full •Reading data
2	Reserved (Do not change settings)		Fixed to Off
3, 4	Undefined	---	
5-7	Reserved (Do not change settings)		Fixed to Off
8	I/F pin 31 reset signal (Do not change settings)	Fixed to On	

NOTES:
- Changes in DIP switch settings (excluding switch 2-8, interface reset signal) are recognized only when the printer power is turned on or when the printer is reset by using the interface. If the DIP switch setting is changed after the printer power is turned on, the change does not take effect until the printer is turned on again or is reset.
- DIP switch 2-8 is turned on while the printer power is turned on, the printer may be reset, depending on the signal state. DIP switches should not be changed while the printer power is on.

3.4 Panel LED Indicators

1) Power supply (POWER) LED: Green

On: Power is stable.

Off: Power is not stable.

2) Error (ERROR) LED: Red

On: Offline (except during paper feeding using the FORWARD and the REVERSE buttons and during self test printing)

Off: Normal condition

Blinking: Error (refer to Section 3.7)

3) RELEASE LED: Green

On: The print platen and paper feed roller are released.

Off: The print platen and paper feed roller are clamped together. (During printing on slip paper.)

Blinking Waiting for continuous self test printing or macro execution standby state

4) SLIP LED: Green

On: Always On except Off or blinking status.

Off: When ejecting a slip paper.

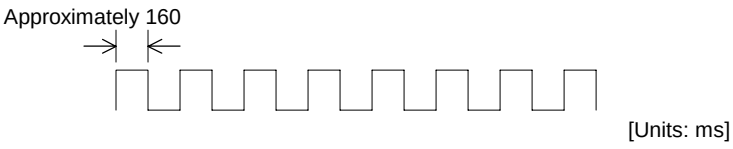
Blinking: Slip insertion/removal waiting

[redacted]

Figure 3.4.1 Panel Switches and Indicators

Blinking: Slip insertion waiting state

Figure 3.4.2



Blinking: Slip removal waiting state or personal check removal waiting state

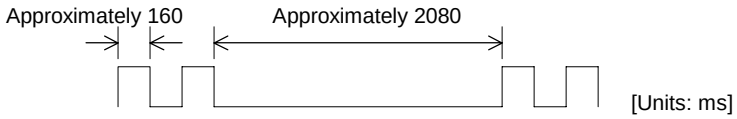


Figure 3.4.3

Blinking: Personal check insertion waiting state

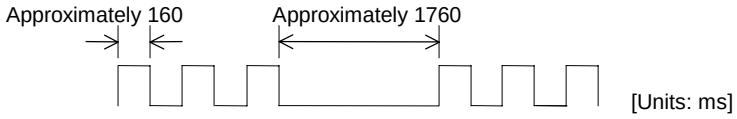


Figure 3.4.4

3.5 Self-test

1) The printer has a self-test function that checks the following:

- Control circuit functions
- Printer mechanisms
- Print quality
- Control software version
- DIP switch settings

2) Starting the self-test

To start the self-test on slip paper, hold down the REVERSE button and turn on the printer with the cover closed. The printer enters the paper insertion waiting state. Insert slip paper to begin printing the printer status.

3) Self-test standby state

After printing the current printer status, the printer ejects the slip and waits for the next slip paper to be inserted.

4) Ending the self-test

After a number of lines are printed, the printer indicates the end of the self-test by printing "*** completed ***", initializes, and goes to the normal mode.

The printer then prints the current printer status.

3.6 Hexadecimal Dumping

1) Hexadecimal dumping function

This function prints the data transmitted from the host computer in hexadecimal numbers and in its corresponding characters.

2) Starting hexadecimal dumping

Open the cover and turn the power on while pressing the REVERSE button, then close the cover. The printer first prints "Hexadecimal Dump" on a validation paper and prints the received print data in hexadecimal numbers and in its corresponding characters.

NOTES:
- If no characters correspond to the data received, the printer prints ".".
- During hexadecimal dumping, any commands other than **DLE EOT** and **DLE ENQ** do not function.

3) Ending hexadecimal dumping

Hexadecimal dumping ends by turning the power off or resetting the printer after printing has finished.

<Printing example>

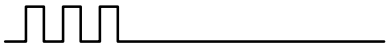
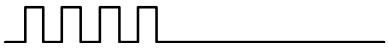
```
Hexadecimal Dump

1B 40 1B 21 00 41 42 43 44 45 46 47 48 49 4A 4B    .@.!.ABCDEFGHIJK
4C 4D 4E 4F 50 51 52 53 54 55 56 57 58 59 5A 0C    LMNOPQRSTUVWXYZ.
```

3.7 Error Processing

3.7.1 Error Types

1) Errors that have the possibility of recovery

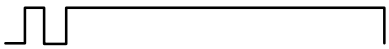
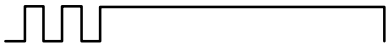
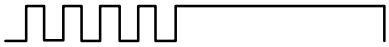
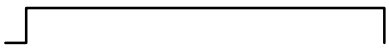
Table 3.7.2 Errors That Can Possibly Recover

Error	Description	ERROR LED Blinking Pattern ← 160 ms →	Recovery
Home position detection error	The home position cannot be detected due to a paper jam.		Recovers by **DLE ENQ 1** or **DLE ENQ 2**.
Carriage detection error	The carriage is malfunctioning due to a paper jam, etc.		Recovers by **DLE ENQ 1** or **DLE ENQ 2**.
Front cover open error	Printing on the slip is not performed correctly due to a cover-open		Recovers by **DLE ENQ 1** or **DLE ENQ** 2 with the cover closed.
Slip ejection error	The slip is not ejected when the printer feeds a specified amount of paper.		Recovers by **DLE ENQ 1** or **DLE ENQ 2**.

NOTES:
- Errors that have the possibility of recovery are recovered by **DLE ENQ 1** or **DLE ENQ 2**.
- When the printer recovers from an error using **DLE ENQ 1** the printer first ejects the slip, then loads paper. However, when the printer recovers from a slip ejection error, the printer only ejects the slip and does not load paper.
- When the printer recovers from an error using **DLE ENQ 2** the printer ejects the slip and does not wait the paper insertion.

2) Errors that are impossible to recover

Table 3.7.3 Unrecoverable Errors

Error	Description	ERROR LED Blinking Pattern →| |← 160 ms	Recovery
R/W error in memory or gate array	After R/W checking, the printer does not work correctly.		Impossible to recover.
High voltage error	The power supply voltage is extremely high. (*)		Impossible to recover.
Low voltage error	The power supply voltage is extremely low. (*)		Impossible to recover.
CPU execution error	• The CPU executes an incorrect address. • I/F board is not connected.		Impossible to recover.
Thermistor error	• There is an abnormality in the print head temperature, thermistor is detected in-correctly, of thermistor wiring is not connected.		Impossible to recover.

(*) Refer to Appendix A.

NOTE: When any error shown above occurs, turn off the power as soon as possible.

3.7.2 Printer Operation When an Error Occurs

The printer executes the following operations when detecting an error.

- Stops all printer operations for the selected paper section.
- Goes offline.
- Blinks the ERROR LED.

3.7.3 Data Receive Error

If one of the following errors occurs during serial interface communication, the printer prints "?" or ignores the data, depending on the setting of DIP switch 1-1.

- Parity error
- Framing error
- Overrun error

3.8 Paper Sensors

The printer has two paper sensors as follows:

- TOF (Top of Form) sensor
- BOF (Bottom of Form) sensor

3.8.1 Sensors and LED Indicators

1) TOF sensor

   The slip insertion sensor is located in the slip paper path and detects the presence of slip paper in the paper path. The SLIP LED indicator lights accordingly.

2) BOF sensor

   The slip ejection sensor is located in the slip entrance and detects whether the paper is set correctly and whether it is removed or not. The printer does not proceed to the next operation until the paper has been removed. (The SLIP LED indicator continues blinking.)

3.8.2 Sensors and Printing

When the printer detects a paper near-end, it either stops or continues printing depending on the **ESC c 4** setting. The corresponding sensors are as follows:

- BOF sensor
- TOF sensor

When the BOF sensor is selected for printing stop, the BOF sensor detects a paper-end and the printer prints data up to the end of the printable area, ejects the slip when all the next print data are transmitted, and then waits for the slip to be removed. After the slip is removed, the printer enters the paper insertion waiting state.

3.9 Printer Cover Sensors

3.9.1 Cover Open Sensor

- The sensor detects opening/closing of the front cover. When the cover open is detected, while printing, the printer releases the print platen immediately and stops the carriage movements. The printer goes offline automatically. The printer is in the recovery error state and the error LED blinks.

  The printer goes online by closing the front cover. Even if the front cover is closed, the error LED blinks. The printer can recover by sending an error recovery command. If the printer continues printing, it starts printing the beginning of the line it was printing when the front cover was opened. In this case, printing position may shift; therefore, it is recommended to initialize the printer and resend the print data.

3.9.2 Opening/Closing the Front Cover

- The cover can be opened by pulling a hook on the left of the cover toward you. When you close the cover, push the cover backward.
- When the cover open is detected by the cover open sensor, while printing, the printer releases the print platen and stops carriage movements. If the front cover is opened during printing, data lines are cut. Be sure not to open the front cover.

3.10 Print Buffer-full Printing

When subsequent data is received after the printer processes one line of data in the print buffer, the printer automatically prints the processed line and feeds the paper by one line.

3.11 Paper Jam Removal

To remove jammed paper from the print head area, open the front cover.

NOTES:
- Since the print head becomes very hot just after printing, remove jammed paper only after the print head cools sufficiently.
- The carriage moves to the specified position after the printer is reset. Do not touch the carriage.

3.12 Page Mode

3.12.1 General Description

The printer operates in two print modes: standard mode and page mode which are effective for the model except for the multilingual model (ANK model). In standard mode, the printer prints and feeds paper each time it receives print data or paper feed commands. In page mode, all the received print data and paper feed commands are processed in the specified memory, and the printer executes no operations. All the data in the memory is then printed when an **ESC FF** or **FF** command is received.

For example, when the printer receives the data "ABCDEF" <**LF**> in standard mode, it prints "ABCDEF" and feeds the paper by one line. In page mode, "ABCDEF" is written to the specified area in memory, and the position in memory for the next print data is shifted by one line.

The **ESC L** command puts the printer into page mode, and all commands received thereafter are processed in page mode. Executing an **ESC FF** command prints the received data collectively, and executing an **FF** command restores the printer to standard mode after the received data is printed collectively. Executing an **ESC S** command restores the printer to standard mode without printing the received data in page mode; the received data is cleared from memory instead.

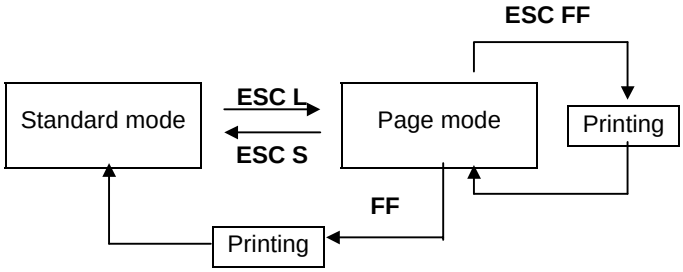


Figure 3.12.1 Shifting Between Standard Mode and Page Mode

3.12.2 Page mode limitations in slip printing (only for ANK model)

Page mode can be performed only in ANK model.

Page mode in slip printing has the following limitations:

1) Half-dots are not usable

   Page mode can handle only normal dots. Therefore, the Font A and B including half-dots, user-defined characters including half-dots, and bit images cannot be specified. The printer selects the Font C (5×9 dots) including normal dots automatically. Since setting values with the **ESC SP, ESC $, ESC \, ESC 3, ESC D, ESC J, ESC K**, and **ESC W** commands uses half-dot references, these values must be converted into values referenced to normal dots. Under these conditions, displacement by one half-dot may occur. Therefore, the following are invalid in page mode:

   - 7×9 font specification using **ESC !** or **ESC M**.
   - Double-density bit image specification using **ESC** *.
   - Double-density down-loaded bit image specification using **GS /**.

2) Double-strike printing is not permitted.

   In page mode, data written twice to the same area is logically OR'ed before printing. Therefore, double-strike mode cannot be used to emphasize characters.

3.12.3 Setting Values in Standard and Page Modes

1) The available commands and parameters are the same for both standard and page modes. However, these values can be set independently in each mode for the **ESC SP**, **ESC 2**, and **ESC 3** commands. For these commands, different settings can be stored for each mode.

2) Although the maximum number of printable dots for a bit image is 800 in standard mode, 1804 half-dots can be printed in the y direction (paper feeding direction) in page mode. (This is possible only when 1804 half-dots in the y direction have been specified using **ESC W**, and the printing direction value *n* in the **ESC T** command is 1 or 3).

3.12.4 Formatting of Print Data in the Printable Area

Formatting of print data in the printable area is performed as follows:

1) The printable area is set using **ESC W**. If all printing and feeding are complete before the printer receives the **ESC W** command, the left side (as you face the printer) is taken as the origin (*x0*, *y0*) of the printable area. The printable rectangular area is defined by the length (dx dots) extending from and including the origin (*x0*, *y0*) in the x direction (perpendicular to the paper feed direction), and by the length (dy dots) in the y direction (paper feed direction). (If the **ESC W** command is not used, the printable area remains the default value.)

2) When the printer receives print data after **ESC W** sets the printable area and **ESC T** sets the printing direction, the print data is formatted within the printable area so that point A in Figure 3.12.2 is at the beginning of the printable area as a default value. (When a character is printed, point B is the baseline.)

   Print data containing downloaded bit images is formatted so that the bottom point of the left side of the image data (point B in Figure 3.12.2) is aligned with the baseline.

   At the beginning of the printable area, if characters (such as double-height characters) higher than normal size characters or downloaded bit image characters are received, any part of the character higher than the normal-size character is not printed.

3) If the print data (including the space to the right of a character) exceeds the printable area before the printer receives a command (e.g., **LF** or **ESC J**) that includes line feeding, a line feed is executed automatically within the printable area. The print position, therefore, moves to the beginning of the next line. The line feed amount depends on the values set by commands (such as **ESC 2** and **ESC 3**).

4) The default value of the line spacing for paper roll is set to approximately 4.23 mm {1/6"} and corresponds to 12 dots. If print data for the next line contains extended characters that are higher than double-height characters, or bit images taking up two or more lines, the amount of line feeding may be insufficient, resulting in overlapping of the characters' higher-order dots with the previous line. To avoid this, increase the amount of line spacing. The line spacing requires 15 dots (30 pitch) or more (see Figure 3.12.2).

Example

When printing a downloaded bit image of three bytes in the vertical direction, use the following formula:

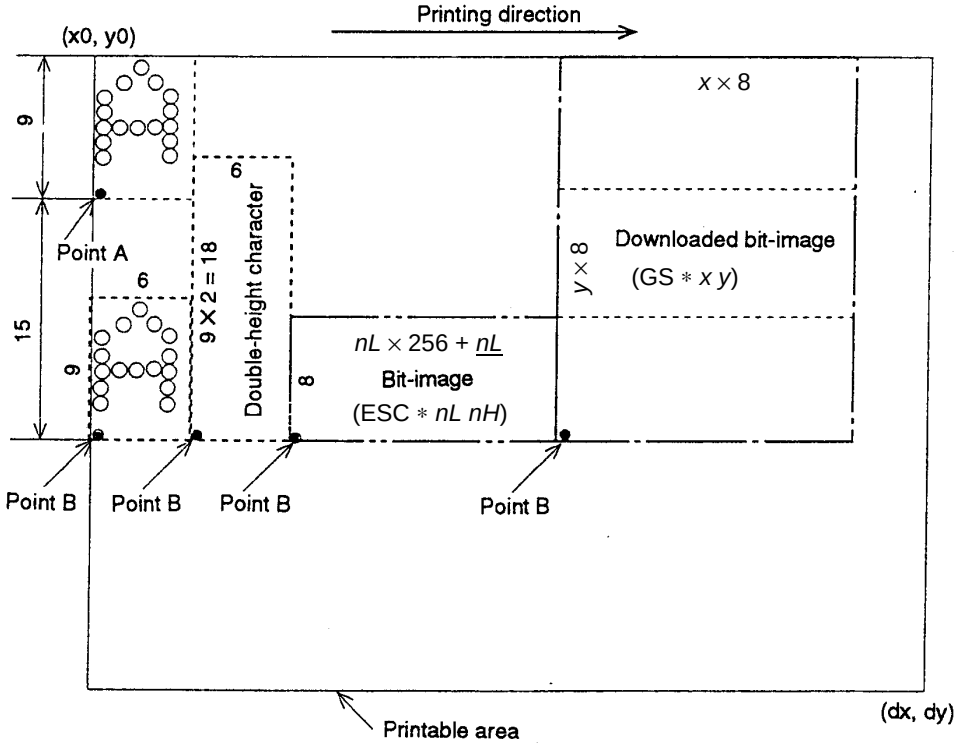
{number of vertical dots (8 × 3) - number of dots for feeding at the beginning of the printable area (9)} × half-dot conversion (2) = 30

Therefore, 54 pitch (27 dots) are required for feeding.

Use the following commands:

ESC W *xL*, *xH*, *yL*, *yH*, *dxL*, *dxH*, *dyL*, *dyH*
ESC T *n*
ESC 3 30 ← Set line spacing to be added.
LF
GS/ 1
ESC 2 ← Reset the line spacing to approximately 4.23 mm {1/6"}.

NOTE: Vertical and horizontal motion units in paper roll are 1/360 in the vertical direction and 1/180 in the horizontal direction; therefore, the position you specify varies depending on the printing direction. Setting the vertical motion unit to 1/180 using the **GS P** command does not change the current print position.



[Units: dot]

Figure 3.12.2 Downloaded Bit Image Developing Position

4. CASE SPECIFICATIONS

4.1 External Dimensions and Mass

Height: 185 mm {7.28"}

Width: 252 mm {9.92"}

Depth: 205 mm {8.07"} (except for the protrusion)

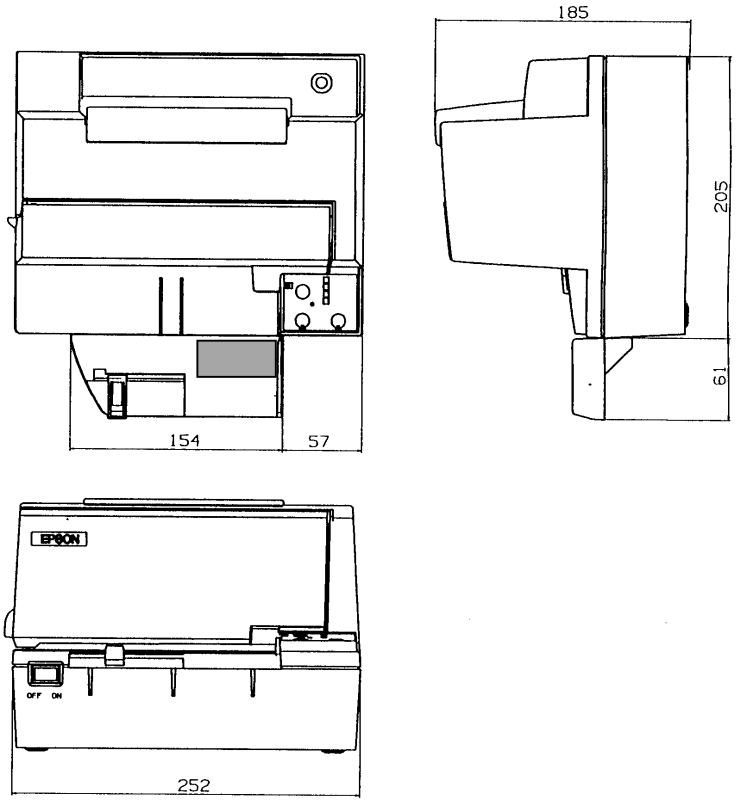
Mass: Approximately 5 kg {11.0 lbs}

(All the numeric values are typical.)

4.2 Color

EPSON standard color (ECW)

4.3 External Appearance



Materials for the external: 94V-0

[Units : mm]

Figure 4.3.1 External Appearance

5. OPTIONS AND CONSUMABLES

5.1 Standard Accessories

- Exclusive ribbon cassette ERC-31(P)
- User's Manual
- I/F fixing screw (hexagonal millimeter screw)
- Power switch cover

5.2 Options

- External power supply PS-170
- Direct connection customer display DM-D series (DM-D102/DM-D203)

5.3 Consumables

- Ribbon Cassette
  ERC-31(P)
  ERC-31(B) (Life: 4,500,000 characters)
  In Japan: EPSON HANBAI Co., LTD.
  In U.S.A.: EPSON America Inc.
  In Europe: EPSON Europe B.V.

6. COMMANDS

6.1 Command Notation

XXXX

[Name]	The name of the command.
[Format]	The code sequence.
	ASCII indicates the ASCII equivalents.
	Hex indicates the hexadecimal equivalents.
	Decimal indicates the decimal equivalents.
	[ ]*k* indicates the contents of the [ ] should be repeated *k* times.
[Range]	Gives the allowable ranges for the arguments.
[Description]	Describes the function of the command.
[Notes]	Provides important information on setting and using the printer command, if necessary.
[Default]	Gives the default values, if any, for the command parameters.
[Reference]	Lists related commands.
[Example]	Provides examples using the command.

The numbers denoted by < >H are hexadecimal.

The numbers denoted by < >B are binary.

The numbers denoted by < > are decimal.

6.2 Explanation of Terms

(1) Reception buffer
The reception buffer is a buffer that stores, as is, the data received from the host (the reception data). The reception data is stored in the reception buffer temporarily, and is then processed sequentially.

(2) Print buffer
The print buffer is a buffer that stores the image data to be printed.

(3) Print buffer full
This is the state where the print buffer is full. If new print data is input while the print buffer is full, the data in the print buffer is printed out and a line feed is executed. This is the same operation as the **LF** operation.

(4) Start of line
The start of line state satisfies the following condition:

- There is no print data (including spaces and portions of data skipped due to **HT**) currently in the print buffer.
- The print position is not specified by the **ESC $** or **ESC ** command.

(5) Printable area
The maximum range within which printing is possible under the printer specifications. The printable area for this printer is as follows:

① The length in the horizontal direction in standard mode:
Approximately 135.467 mm {800/150"}

② The length in the horizontal dimension in page mode: Approximately 135.467 mm {800/150"}

③ The length in the vertical dimension in page mode: Approximately 318.206 mm {1804/144"}

(6) Printing area
Printing range is set by the command. It must be printing area ≤ printable area.

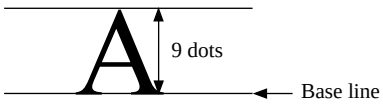
(7) Ignore
The state in which all codes, including parameters, are read in and discarded, and nothing happens.

(8) Inch
A unit of length. One inch is 25.4 mm.

(9) MSB
Most Significant Bit

(10) LSB
Least Significant Bit

(11) Base line
Standard position when character data is stored in the print buffer.



6.3 Control Commands

HT

[Name] Horizontal tab

[Format] ASCII HT
Hex 09
Decimal 9

[Description] Moves the print position to the next horizontal tab position.

[Notes]
- Horizontal tab positions are set with **ESC D**.
- If the next horizontal tab position exceeds the printing area, the printer sets the printing position to [Printing area width + 1].
- If this command is received when the printing position is at [printing area width + 1], the printer executes print buffer-full printing of the current line and horizontal tab processing from the beginning of the next line.
- This command is ignored unless the next horizontal tab position has been set.
- The default setting of the horizontal tab position for the slip paper is font A (9 × 9) every 8th character (9th, 17th, 25th, ... column).

[Reference] **ESC D**

LF

[Name] Print and line feed

[Format] ASCII LF
Hex 0A
Decimal 10

[Description] Prints the data in the print buffer and feeds one line based on the current line spacing.

[Note] This command sets the print position to the beginning of the line.

[Reference] **ESC 2**, **ESC 3**, Appendix A.1

FF

[Name] ① Print and eject slip paper
② Print and return to standard mode in page mode

[Format]

ASCII	FF
Hex	0C
Decimal	12

For ①

[Description] Prints the data in print buffer and ejects the slip paper.

[Notes]
- When the slip ejection length has been set by **ESC C**, the specified length is ejected, regardless of the TOF and BOF sensors.
- The slip is ejected in the direction specified by **ESC F**.
- This command sets the print position to the beginning of the line.

[Reference] **ESC C**, **ESC F**

For ②

[Description] Prints the data in the print buffer collectively and returns to standard mode.

[Notes]
- This command is enabled only in page mode.
- The buffer data is deleted after being printed.
- The printing area set by **ESC W** is reset to the default setting.
- This command sets the print position to the beginning of the line.

[Reference] **ESC FF**, **ESC L**, **ESC S**

CR

[Name] Print and carriage return

[Format]

ASCII	CR
Hex	0D
Decimal	13

[Description]

Automatic line feed enabled	Automatic line feed disabled
Functions as same as **LF**	Prints the data in the print buffer and does not feed the paper.

[Notes]
- This command sets the print starting position to the beginning of the line.
- With a serial interface model, this command executes the same operation as when disabling the automatic line feed.
- With a parallel interface model.This command is set according to the DIP switch 1-1 setting.

[Reference] **LF**

CAN

[Name] Cancel print data in page mode

[Format]

ASCII	CAN
Hex	18
Decimal	24

[Description] In page mode, deletes all the print data in the current printable area.

[Notes]
- This command is enabled only in page mode.
- If data that existed in the previously specified printing area also exists in the currently specified printing area, it is deleted.

[Reference] **ESC L**, **ESC W**

DLE EOT *n*

[Name] Real-time status transmission

[Format]

ASCII	DLE	EOT	*n*
Hex	10	04	*n*
Decimal	16	4	*n*

[Range] $1 \le n \le 3$, $n = 5$

[Description] Transmits the selected printer status specified by *n* in real time, according to the following parameters:

n = 1: Transmit printer status

n = 2: Transmit offline status

n = 3: Transmit error status

n = 5: Transmit slip paper status

[Notes]
- The printer transmits the status without confirming whether the host computer can receive data.
- The printer executes this command upon receiving it.
- This command is executed even when the printer is offline, the receive buffer is full, or there is an error status with a serial interface model.
- With a parallel interface model, this command can not be executed when the printer is busy. This command is executed even when the printer is offline or there is an error status when DIP switch 2-1 is on with a parallel interface model.
- The status is transmitted whenever the data sequence of <10>H<04>H*n* ($1 \le n \le 5$) is received.
  Example:
  In **ESC** ∗ ***m*** n_L n_H ***d1 ... dk***, *d1*=<10>H, *d2*=<04>H, *d3*=<01>H

- This command should not be used within the data sequence of another command that consists of 2 or more bytes.
  Example:
  If you attempt to transmit **ESC 3 *n*** to the printer, but DTR (DSR for the host computer) goes to MARK before *n* is transmitted and then **DLE EOT 3** interrupts before *n* is received, the code <10>H for **DLE EOT 3** is processed as the code for **ESC 3** <10H>.
- When Auto Status Back (ASB) is enabled using the **GS a** command, the status transmitted by the **DLE EOT** command and the ASB status must be differentiated. Refer to Appendix C, Transmission Status Identification.
- This command is ignored when the printer is deselected by set peripheral device command, **ESC =**.
- The printer transmits the current status. Each status is represented by one-byte data.

n = 1: Printer status

Bit	Off/On	Hex	Decimal	Function
0	Off	00	0	Not used. Fixed to Off.
1	On	02	2	Not used. Fixed to On.
2	Off	00	0	Drawer open/close signal is LOW (connector pin 3).
	On	04	4	Drawer open/close signal is HIGH (connector pin 3).
3	Off	00	0	Online.
	On	08	8	Offline.
4	On	10	16	Not used. Fixed to On.
5,6	-	-	-	Undefined.
7	Off	00	0	Not used. Fixed to Off.

Bit 3:
- The printer enters offline when the printer cover is open while printing is stopped.
- The printer enters recoverable error status when cover is open during printing.

n = 2: Offline status

Bit	Off/On	Hex	Decimal	Function
0	Off	00	0	Not used. Fixed to Off.
1	On	02	2	Not used. Fixed to On.
2	Off	00	0	Cover is closed.
	On	04	4	Cover is open.
3	Off	00	0	Paper is not being fed by using the FORWARD/REVERSE button.
	On	08	8	Paper is being fed by the FORWARD/REVERSE button.
4	On	10	16	Not used. Fixed to On.
5	Off	00	0	No paper-end stop.
	On	20	32	Printing is being stopped.
6	Off	00	0	No error.
	On	40	64	Error occurs.
7	Off	00	0	Not used. Fixed to Off.

Bit 5: The printer does not enter offline when the printer detects paper end and printing stops.

n = 3: Error status

Bit	Off/On	Hex	Decimal	Function
0	Off	00	0	Not used. Fixed to Off.
1	On	02	2	Not used. Fixed to On.
2	Off	00	0	No mechanical error.
	On	04	4	Mechanical error occurs.
3	--	--	--	Undefined.
4	On	10	16	Not used. Fixed to On.
5	Off	00	0	No unrecoverable error.
	On	20	32	Unrecoverable error occurs.
6	--	--	--	Undefined.
7	Off	00	0	Not used. Fixed to Off.

Bit 2: Mechanical error indicates the home position detection error, carriage detection error, slip paper ejection error, or cover open error during printing.

If these errors occur due to paper jams or the like, it is possible to recover by correcting the cause of the error and executing **DLE ENQ *n*** ($1 \leq n \leq 2$). If an error due to a circuit failure (e.g. wire break) occurs, it is impossible to recover.

n = 5: Slip paper status

Bit	Off/On	Hex	Decimal	Function
0	Off	00	0	Not used. Fixed to Off.
1	On	02	2	Not used. Fixed to On.
2	Off	00	0	Slip paper selected.
3	Off	00	0	Does not wait for slip paper insertion.
	On	08	8	Waits for slip paper insertion.
4	On	10	16	Not used. Fixed to On.
5	Off	00	0	TOF sensor: paper present.
	On	20	32	TOF sensor: paper not present.
6	Off	00	0	BOF sensor: paper present.
	On	40	64	BOF sensor: paper not present.
7	Off	00	0	Not used. Fixed to Off.

Bit 3: Becomes 0 (slip insertion is not waiting) just before the platen being closed after detecting it.

Bit 5 and 6: Transmit the current status of the slip sensors.

[Reference] **DLE ENQ**, **GS a**, **GS r**, Appendix C

DLE ENQ *n*

[Name] Real-time request to printer

[Format]

ASCII	DLE	ENQ	*n*
Hex	10	05	*n*
Decimal	16	5	*n*

[Range] *n* = 1, *n* = 2

[Description] Responds to a request from the host computer. *n* specifies the requests as follows:

n	**Request**
1	Recover from an error and restart printing from the line where the error occurred
2	Recover from an error aft clearing the receive and print buffers

[Notes]

- The printer starts processing data upon receiving this command.
- This command is executed even when the printer is offline, the receive buffer is full, or there is an error status with a serial interface model.
- With a parallel interface model, this command can not be executed when the printer is busy. This command is executed even when the printer is offline or there is an error status when DIP switch 2-1 is on with a parallel interface model.
- The status is also transmitted whenever the data sequence of <10>H<05>H*n* (1 ≤ *n* ≤ 3) is received.
  Example:
  In **ESC** ∗ ***m nL nH d1 ... dk***, *d1*=<10>H, *d2*=<05>H, *d3*=<01>H
- This command should not be contained within another command that consists of two or more bytes.
  Example:
  If you attempt to transmit **ESC 3** ***n*** to the printer, but DTR (DSR for the host computer) goes to MARK before *n* is transmitted, and **DLE ENQ 1** interrupts before *n* is received, the code <10>H for **ESC 3** is processed.
- **DLE ENQ 1** starts printing from the line where an error occurred. This command is available only for errors that have the possibility of recovery.
- When the printer recovers from a recoverable error using **DLE ENQ 1** or **DLE ENQ 2**, and slip paper is selected, the printer ejects the slip completely and is in the slip waiting state.
- **DLE ENQ 2** enables the printer to recover from an error after clearing the data in the receive buffer and the print buffer. The printer retains the settings (by **ESC !**, **ESC 3**, etc.) that were in effect when the error occurred. The printer can be initialized completely by using this command and **ESC** @. This command is enabled only for errors that have the possibility of recovery.
- When the printer is disabled with **ESC =** (Select peripheral device), the error recovery functions are enabled, and the other functions are disabled.

[Reference] **DLE EOT**

DLE DC4 *n m t* (when *n* = 1)

[Name] Generate pulse in real time

[Format]

ASCII	DLE	DC4	*n*	*m*	*t*
Hex	10	14	*n*	*m*	*t*
Decimal	16	20	*n*	*m*	*t*

[Range]
n = 1
m = 0, 1
$1 \le t \le 8$

[Description] Outputs the pulse specified by *t* to connector pin m as follows:

m	Connector pin
0	Drawer kick-out connector pin 2.
1	Drawer kick-out connector pin 5.

The pulse ON time is [$t \times 100$ ms] and the OFF time is [$t \times 100$ ms].

[Details]
- When the printer is in an error status when this command is processed, this command is ignored.
- If a pulse is output to the connector pin specified while **ESC p** or **DLE DC4** is executed, this command is ignored.
- The printer executes this command upon receiving it.
- With a serial interface model, this command is executed even when the printer is offline or the receive buffer is full.
- With a parallel interface model, this command cannot be executed when the printer is busy. This command is executed even when the printer is offline or there is an error status when DIP switch 2-1 is on.
- This command is effective even when the printer is disabled with **ESC =** (Select peripheral device).

[Notes]
- If print data includes this command string, the printer performs this command. The user must consider this.
- This command should not be used within the data sequence of another command that consists of 2 or more bytes.

[Reference] **ESC p**

DLE DC4 *n d1...d7* (when *n* = 8)

[Name] Clear buffer(s)

[Format]

ASCII	DLE	DC4	*n*	*d1...d7*
Hex	10	14	*n*	*d1...d7*
Decimal	16	20	*n*	*d1...d7*

[Range] *n* = 8
d1 = 1, *d2* = 3, *d3* = 20, *d4* = 1, *d5* = 6, *d6* = 2, *d7* = 8

[Description]
- Clear all data stored in the receive buffer and the print buffer.
- Transmits the following data block to the host.
  Header: Hexadecimal = 37H / Decimal = 55 (1 byte)
  Status: Hexadecimal = 25H / Decimal = 37 (1 byte)
  NUL: Hexadecimal = 00H / Decimal = 0 (1 byte)
- After this command is executed, the printer selects the paper roll as the paper source and enters the standard mode.

[Details]
- This command is effective even when the printer is disabled with **ESC =** (select peripheral device).
- If another command is being executed while this command is processed, the execution of the other command is stopped.
- If this command is processed in a slip insertion waiting state, the waiting state is cancelled. This process is same as for **DLE ENQ 3**.
- If this command is processed when a recoverable error occurs, the printer recovers from the error state. This process is same with **DLE ENQ 2**.
- If this command is processed in page mode, the printer enters the standard mode. In this case, the printer sets the default values to **ESC W** (only for ANK model).
- This command does not affect and initialize the setting values for other commands (except for **ESC W** in a page mode).
- With a serial interface model, this command is executed even when the printer is offline, the receive buffer is full, or there is an error status.
- With a parallel interface mode, this command cannot be executed when the printer is busy. This command is executed even when the printer is offline or there is an error status when DIP switch 2-1 is on.

[Notes]
- This command must not be used in a system using this printer and the EPSON OPOS driver.
- If print data includes this command string, the printer performs this command. The user must consider this.
- This command should not be used within the data sequence of another command that consists of 2 or more bytes.

ESC FF

[Name] Print data in page mode

[Format]

ASCII	ESC	FF
Hex	1B	0C
Decimal	27	12

[Description] In page mode, prints all buffered data in the printing area collectively.

[Notes]
- This command is enabled only in page mode.
- After printing, the printer does not clear the buffered data, setting values for **ESC T** and **ESC W**, and the position for buffering character data.

[Reference] **FF**, **ESC L**, **ESC S**

ESC SP *n*

[Name] Set right-side character spacing

[Format]

ASCII	ESC	SP	*n*
Hex	1B	20	*n*
Decimal	27	32	*n*

[Range] $0 \le n \le 255$

[Description] Sets the character spacing for the right side of the character to [$n \times$ horizontal or vertical motion units].

[Notes]
- The right-side character spacing for double-width mode is twice the normal value.
- The horizontal and vertical motion unit are specified by **GS P**. Changing the horizontal or vertical motion unit does not affect the current right-side spacing.
- The **GS P** command can change the horizontal (and vertical) motion unit. However, the value cannot be less than the minimum horizontal movement amount, and it must be in even units of the minimum horizontal movement amount.
- The maximum right-side spacing is 43.18 mm {255/180"} for the slip paper. Any setting exceeding the maximum is converted to the maximum automatically.
- This command sets values independently in each mode (standard and page modes).
- In standard mode, the horizontal motion unit is used.
- In page mode, the horizontal or vertical motion unit differs, depending on starting position of the printable area as follows:
  1 When the starting position is set to the upper left or lower right of the printable area using **ESC T**, the horizontal motion unit (*x*) is used.
  2 When the starting position is set to the upper right or lower left of the printable area using **ESC T**, the vertical motion unit (*y*) is used.

[Default] *n* = 0

[Reference] **GS P**

ESC ! *n*

[Name] Select print mode(s)

[Format]

ASCII	ESC	!	*n*
Hex	1B	21	*n*
Decimal	27	33	*n*

[Range] $0 \le n \le 255$

[Description] Selects print mode(s) using *n* as follows:

Bit	Off/On	Hex	Decimal	Function
0	Off	00	0	Character font A (9 × 9) for selected.
	On	01	1	Character font B (7 × 9) for selected.
1	-	-	-	Undefined.
2	-	-	-	Undefined.
3	Off	00	0	Emphasized mode not selected.
	On	08	8	Emphasized mode selected.
4	Off	00	0	Double-height mode not selected.
	On	10	16	Double-height mode selected.
5	Off	00	0	Double-width mode not selected.
	On	20	32	Double-width mode selected.
6	-	-	-	Undefined.
7	Off	00	0	Underline mode not selected.
	On	80	128	Underline mode selected.

[Notes]

- When both double-height and double-width modes are selected, quadruple size characters are printed.
- The printer can underline all characters, but can not underline the space set by **HT** or 90° clockwise rotated characters.
- The thickness of the underline is that selected by **ESC -**, regardless of the character size.
- When some characters in a line are double or more height, all the characters on the line are aligned at the baseline.
- **ESC E** can also turn on or off emphasized mode. However, the setting of the last received command is effective.
- **ESC -** can also turn on or off underline mode. However, the setting of the last received command is effective.
- **GS !** can also select character size. However, the setting of the last received command is effective.

- **ESC M** can also select character font types. However the setting of the last received command is effective.
- If the underline mode is selected, the lowest dot is printed in the same position as the underline. Therefore, some characters may be hard to see.

[Default] $n = 0$

[Reference] **ESC -**, **ESC E**, **ESC M**, **GS !**

ESC $ n_L n_H

[Name] Set absolute print position

[Format]

ASCII	ESC	$	n_L	n_H
Hex	1B	24	n_L	n_H
Decimal	27	36	n_L	n_H

[Range] $0 \le n_L \le 255$

$0 \le n_H \le 255$

[Description] Sets the distance from the beginning of the line to the position at which subsequent characters are to be printed.

- The distance from the beginning of the line to the print position is $[(n_L + n_H \times 256) \times$ (vertical or horizontal motion unit)] inches.

[Notes]
- Settings outside the specified printable area are ignored.
- The horizontal and vertical motion unit are specified by **GS P**.
- The **GS P** command can change the horizontal (and vertical) motion unit. However, the value cannot be less than the minimum horizontal movement amount, and it must be in even units of the minimum horizontal movement amount.
- In standard mode, the horizontal motion unit (x) is used.
- In page mode, the horizontal or vertical motion unit differs, depending on the starting position of the printable area as follows:
  1 When the starting position is set to the upper left or lower right of the printable area using **ESC T**, the horizontal motion unit (x) is used.
  2 When the starting position is set to the upper right or lower left of the printable area using **ESC T**, the vertical motion unit (y) is used.

[Reference] **ESC **, **GS $**, **GS **, **GS P**

ESC % *n*

[Name]	Select/cancel user-defined character set			
[Format]	ASCII	ESC	%	*n*
	Hex	1B	25	*n*
	Decimal	27	37	*n*

[Range] $0 \leq n \leq 255$

[Description] Selects or cancels the user-defined character set.

- When the LSB is 0, the user-defined character set is cancelled.
- When the LSB is 1, the user-defined character set is selected.

[Notes]
- *n* is available only for the least significant bit.
- When the user-defined character set is cancelled, the internal character set is automatically selected.

[Default] *n* = 0

[Reference] **ESC &**, **ESC ?**

ESC & *y c1 c2 [x1 d1...d(y × x1)]...[xk d1...d(y × xk)]*

[Name] Define user-defined characters

[Format]

ASCII	ESC	&	*y*	*c1*	*c2 [x1 d1...d(y × x1)]...[xk d1...d(y × xk)]*
Hex	1B	26	*y*	*c1*	*c2 [x1 d1...d(y × x1)]...[xk d1...d(y × xk)]*
Decimal	27	38	*y*	*c1*	*c2 [x1 d1...d(y × x1)]...[xk d1...d(y × xk)]*

[Range] $y = 2$

$32 \le c1 \le c2 \le 126$

$0 \le x \le 12$ (When Font A (9×9) is selected)

$0 \le x \le 9$ (When Font B (7×9) is selected)

$0 \le x \le 6$ (When Font C (5×9) is selected in page mode)

$0 \le d \le 255$

[Description] Defines user-defined characters.

- *y* specifies the number of bytes in the vertical direction.
- *c1* specifies the beginning character code for the definition, and *c2* specifies the final code.
- *x* specifies the number of dots in the horizontal direction.

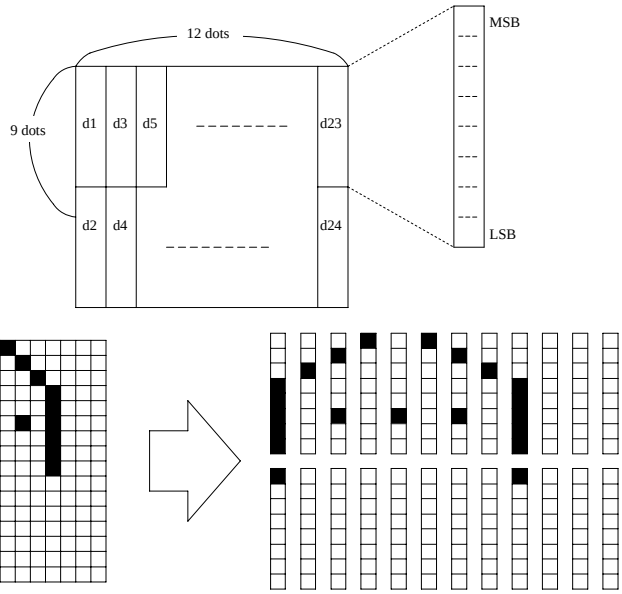
[Notes]

- The allowable character code range is from ASCII code <20>H to <7E>H (95 characters).
- It is possible to define multiple characters for consecutive character codes. If only one character is desired, use *c1 = c2*.
- *d* is the dot data for the characters. The dot pattern is in the horizontal direction from the left side. Any remaining dots on the right side are blank.
- The dots adjoining each other horizontally cannot be printed.
- Only the upper most bit can be printed in the second byte in the vertical direction.
- The data to define a user-defined character is ($y \times x$) bytes.
- Set a corresponding bit to 1 to print a dot or 0 not to print a dot.
- This command can define different user-defined character patterns for each font. To select a font, use **ESC !**. However, font C is always set in page mode when slip is selected, regardless of selecting of any types of font.
- A user-defined character and a downloaded bit image cannot be defined simultaneously. When this command is executed, the downloaded bit image is cleared.
- The user-defined character definition is cleared when:
  ESC @ is executed.
  ESC ? is executed.
  GS * is executed.
  The printer is reset or the power is turned off.

[Default] The internal character set

[Reference] **ESC %**, **ESC ?**

[Example]



d1 = 1FH, d3 = 20H, d5 = 44H, . . .
d2 = 80H, d4 = 00H, d6 = 00H, . . .

ESC ∗ *m* n_L n_H *d1 ... dk*

[Name] Select bit-image mode

[Format]

ASCII	ESC	∗	*m*	n_L	n_H	*d1 ... k*
Hex	1B	2A	*m*	n_L	n_H	*d1 ... k*
Decimal	27	42	*m*	n_L	n_H	*d1 ... k*

[Range] *m* = 0, 1 (in standard mode)
m = 0 (in page mode)
$0 \le n_L \le 255$
$0 \le n_H \le 3$
$0 \le d \le 255$
$k = n_L + n_H \times 256$

[Description] Selects a bit-image mode using *m* for the number of dots specified by n_L and n_H, as follows:

m	**Mode**	**Vertical Direction**	**Horizontal Direction**	
		Number of Dots	**Dot adjacency**	**Maximum number of dots in horizontal**
0	8-dot single-density	8	Available	400 dots
1	8-dot double-density	8	Not available	800 dots

[Notes]

- If the values of *m* is out of the specified range, n_L and data following are processed as normal data.
- The n_L and n_H indicate the number of dots of the bit image in the horizontal direction. The number of dots is calculated by $n_L + n_H \times 256$.
- If the bit-image data input exceeds the number of dots to be printed on a line, the excess data is ignored.
- *d* indicates the bit-image data. Set a corresponding bit to 1 to print a dot or to 0 to not print a dot.
- If the width of the printing area set by **GS L** and **GS W** less than the width required by the data sent with the **ESC ∗** command, the following will be performed on the line in question for each bit of data in single-density mode (*m*=0), the printer prints two dots (two half dot for the slip): for each bit of data in double-density mode (*m*=1), the printer prints one dot (one half dot for the slip):

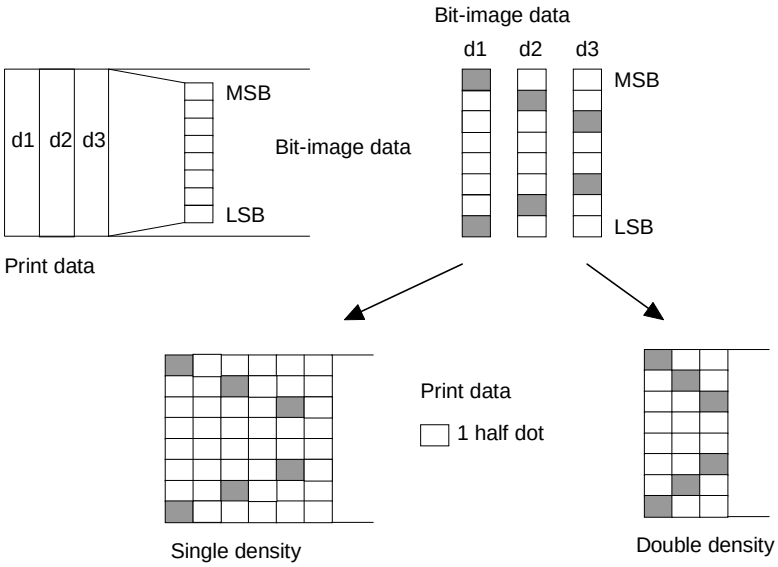
① The width of the printing area is extended to the right to accommodate the amount of data.

② If step ① does not provide sufficient width for the data, the left margin is reduced to accommodate the data.

- After printing a bit image, the printer returns to normal data processing mode.
- This command is not affected by print modes (emphasized, double-strike, underline, or character size), except upside-down printing mode.

- The relationship between the image data and the dots to be printed is as follows:

8-dot bit image



ESC - *n*

[Name] Turn underline mode on/off

[Format]

ASCII	ESC	-	*n*
Hex	1B	2D	*n*
Decimal	27	45	*n*

[Range] *n* = 0, 1, 48, 49

[Description] Turns underline mode on or off, based on the following values of *n*:

n	**Function**
0, 48	Turns off underline mode
1, 49	Turns on underline mode (1-dot thick)

[Notes]
- The printer can underline all characters (including right-side character spacing), but cannot underline the space set by **HT.**
- The printer cannot underline 90° clockwise rotated characters and white/black inverted characters.
- Changing the character size does not affect the current underline thickness.
- Underline mode can also be turned on or off by using **ESC !**. Note, however, that the last received command is effective.

[Default] *n* = 0

[Reference] **ESC !**

ESC 2

[Name] Select default line spacing

[Format]

ASCII	ESC	2	
Hex	1B	32	
Decimal	27	50	

[Description] Selects approximately 4.23 mm {1/6"} line spacing.

[Notes]
- The line spacing can be set independently in standard mode and in page mode.

[Reference] **ESC 3**

ESC 3 *n*

[Name] Set line spacing

[Format]

ASCII	ESC	3	*n*
Hex	1B	33	*n*
Decimal	27	51	*n*

[Range] $0 \le n \le 255$

[Description] Sets the line spacing to [$n \times$ vertical or horizontal motion unit] inches.

[Notes]
- The horizontal and vertical motion unit are specified by **GS P**. Changing the horizontal or vertical motion unit does not affect the current line spacing.
- The **GS P** command can change the horizontal (and vertical) motion unit. However, the value cannot be less than the minimum vertical movement amount, and it must be in even units of the minimum vertical movement amount.
- In standard mode, the vertical motion unit (y) is used.
- In page mode, this command functions as follows, depending on the starting position of the printable area:
  ① When the starting position is set to the upper left or lower right of the printable area using **ESC T**, the vertical motion unit (y) is used.
  ② When the starting position is set to the upper right or lower left of the print able area using **ESC T**, the horizontal motion unit (*x*) is used.
- The maximum line spacing is 1016 mm {40"}. When the setting value exceeds the maximum, it is converted to the maximum automatically.

[Default] Line spacing corresponding to approximately 4.23 mm {1/6"}

[Reference] **ESC 2**, **GS P**

ESC <

[Name] Return home

[Format]

ASCII	ESC	<	
Hex	1B	3C	
Decimal	27	60	

[Description] Moves the print head to the standby position.

[Notes]
- Since the home position is detected when this command is executed, the printing position may shift after this command is executed.
- The standby position is in the left.

ESC = *n*

[Name] Set peripheral device

[Format]

ASCII	ESC	=	*n*
Hex	1B	3D	*n*
Decimal	27	61	*n*

[Range] $1 \leq n \leq 3$

[Description] Selects device to which host computer sends data, using *n* as follows:

Bit	Off/On	Hex	Decimal	Function
0	Off	00	0	Printer disabled.
	On	01	1	Printer enabled
1	Off	00	0	Customer display disabled.
	On	02	2	Customer display enabled.
2-7	-	-	-	Undefined.

[Notes]
- When the printer is disabled, it ignores all data except for error-recovery commands (**DLE ENQ 1**, **DLE ENQ 2**) until it is enabled by this command.

[Default]

Serial interface specification:

- When turning on the printer:

Direct Connection Customer Display Status	***n***
Customer display is recognized (*1)	2
Customer display is not recognized (*1)	1

- When executing **ESC** @:

  Default values set by **ESC** @ are as follows, depending on the value set by **ESC =** just before processing **ESC** @ and on the setting of DIP switch 2-2:

Direct Connection Customer Display Status Default Value to be Set		***n***		
		1	**2**	**3**
After **ESC** @ Processing	When customer display is connected (*1)	1	2(*2)	2
	When customer display is not connected (*1)	1	2(*2)	1

(*1) Depending on the setting of DIP switch 2-2.

(*2) The printer is disabled and it does not process **ESC** @; therefore, the **ESC =** setting is changed.

Parallel interface specification: *n* = 1

[Reference] **DLE ENQ**

ESC ? *n*

[Name] Cancel user-defined characters

[Format]

ASCII	ESC	?	*n*
Hex	1B	3F	*n*
Decimal	27	63	*n*

[Range] $32 \leq n \leq 126$

[Description] Cancels user-defined characters.

[Notes]
- This command cancels the pattern defined for the character code specified by *n*. After the user-defined characters is canceled, the corresponding pattern for the internal character is printed.
- This command deletes the pattern defined for the specified code in the font selected by **ESC !**.
- If a user-defined character has not been defined for the specified character code, the printer ignores this command.

[Reference] **ESC &**, **ESC %**

ESC @

[Name] Initialize printer

[Format]

ASCII	ESC	@
Hex	1B	40
Decimal	27	64

[Description] Clears the data in the print buffer and resets the printer mode to the mode that was in effect when the power was turned on.

[Notes]
- The DIP switch settings are not checked again.
- The data in the receive buffer is not cleared.
- Printer does not eject and release the slip.

ESC C *n*

[Name] Set slip paper eject length

[Format]

ASCII	ESC	C	*n*
Hex	1B	43	*n*
Decimal	27	67	*n*

[Range] $0 \leq n \leq 255$

[Description] Sets the eject length setting for slip paper to *n* lines.

[Notes]

- When *n* = 0, the eject length setting for slip paper is cancelled. The printer continues feeding the paper until the printer gets to the position where the slip can be ejected. The positions are defined as below:

  When reverse ejection is executed:

  If both TOF and BOF sensors detect a paper present status, paper is fed approximately 80 mm {3.15"} in the reverse paper feed direction.

  If only TOF sensor detects a paper present status, the printer feeds paper until the BOF sensor detects a paper present status and then the paper is fed approximately 80 mm {3.15"} in the reverse paper feed direction. In this case, if the BOF sensor can not detect a paper present status even if the printer feeds paper 450 mm {17.72"}or more, it is a slip ejection error.

  If only BOF sensor detects a paper present status, paper is fed approximately 20 mm {0.79"} in the reverse paper feed direction.

  When forward ejection is executed:

  Paper is fed until the BOF sensor detects a paper-end and then the paper is fed approximately 20 mm {0.79"}in the paper feed direction. In this case, if the BOF sensor can not detect a paper not present status even if the printer feeds paper 450 mm {17.72"} or more, it is a slip ejection error.

- Specified eject length doesn't change even if line spacing changes.
- The maximum eject length that can be set is 450 mm {17.72"}. If the specified amount exceeds 450 mm {17.72"}, the eject length is automatically set to 450 mm {17.72"}.

[Default] *n* = 0

[Reference] **FF**, **ESC 2**, **ESC 3**

ESC D *n*1 ... *nk* NUL

[Name] Set horizontal tab positions

[Format]

ASCII	ESC	D	*n1 ... nk*	NUL
Hex	1B	44	*n1 ... nk*	00
Decimal	27	68	*n1 ... nk*	0

[Range] $1 \le n \le 255$

$0 \le k \le 32$

[Description] Sets horizontal tab positions.

- *n* specifies the column number for setting a horizontal tab position from the beginning of the line.
- *k* indicates the total number of horizontal tab positions to be set.

[Notes]

- The horizontal tab position is stored as a value of [*n* × character width] measured from the beginning of the line. The character width includes the right-side character spacing, and double-width characters are set with twice the width of normal characters.
- This command cancels the previous horizontal tab settings.
- When setting *n* = 8, the print position is moved to column 9 by sending **HT**.
- Up to 32 tab positions (*k* = 32) can be set. Data exceeding 32 tab positions is processed as normal data.
- Transmit [*n*]*k* in ascending order and place a NUL code 0 at the end.
- When [*n*]*k* is less than or equal to the preceding value [*n*]*k*-1, tab setting is finished and the following data is processed as normal data.
- **ESC D NUL** cancels all horizontal tab positions.
- The previously specified horizontal tab positions do not change, even if the character width changes.
- The character width is used with the one in the mode when this command is executed.

[Default] *n* = 8, 16, 24, 32... (intervals of 8 characters (columns 9, 17, 25,...) for the font A (9 × 9).)

[Reference] **HT**

ESC E *n*

[Name]	Turn emphasized mode on/off			
[Format]	ASCII	ESC	E	*n*
	Hex	1B	45	*n*
	Decimal	27	69	*n*
[Range]	$0 \le n \le 255$			
[Description]	Turns emphasized mode on or off			
	When the LSB is 0, emphasized mode is turned off.			
	When the LSB is 1, emphasized mode is turned on.			

[Notes]
- Only the least significant bit of *n* is enabled.
- This command and **ESC !** turn on and off emphasized mode in the same way. The command which is executed at latest is effective.
- Emphasized and double-strike printing appear the same.
- Two-pass printing is executed; therefore, printing speed goes slow.

[Default] *n* = 0

[Reference] **ESC !**

ESC F

[Name]	Set/cancel slip paper reverse eject			
[Format]	ASCII	ESC	F	*n*
	Hex	1B	46	*n*
	Decimal	27	70	*n*
[Range]	$0 \le n \le 255$			
Description]	Sets or cancels the slip paper reverse eject			
	When the LSB is 0, cancels the slip paper reverse eject.			
	When the LSB is 1, sets the slip paper reverse eject.			

[Notes]
- Only the least significant bit of *n* is enabled.
- The command is enabled only when input at the beginning of the line.

[Default] *n* = 1

[Reference] **FF**

ESC G *n*

[Name] Turn on/off double-strike mode

[Format]

ASCII	ESC	G	*n*
Hex	1B	47	*n*
Decimal	27	71	*n*

[Range] $0 \le n \le 255$

[Description] Turns double-strike mode on or off.

- When the LSB of *n* is 0, double-strike mode is turned off.
- When the LSB of *n* is 1, double-strike mode is turned on.

[Notes]
- Only the lowest bit of *n* is enabled.
- Printer output is the same in double-strike mode and in emphasized mode.
- Two-pass printing is executed; therefore, printing speed goes slow.

[Default] *n* = 0

[Reference] **ESC E**

ESC J *n*

[Name] Print and feed paper

[Format]

ASCII	ESC	J	*n*
Hex	1B	4A	*n*
Decimal	27	74	*n*

[Range] $0 \le n \le 255$

[Description] Prints the data in the print buffer and feeds the paper [*n* × vertical or horizontal motion unit] inches.

[Notes]
- After printing is completed, this command sets the print starting position to the beginning of the line.
- The paper feed amount set by this command does not affect the values set by **ESC 2** or **ESC 3**.
- The horizontal and vertical motion unit are specified by **GS P**.
- The **GS P** command can change the vertical (and horizontal) motion unit. However, the value cannot be less than the minimum vertical movement amount, and it must be in even units of the minimum vertical movement amount.
- The maximum paper feed amount is 1016 mm {40"}. Even if a paper feed amount of more than 1016 mm {40"} is set, the printer feeds the paper only 1016 mm {40"}.
- In standard mode, the printer uses the vertical motion unit (*y*).
- In page mode, this command functions as follows, depending on the starting position of the printable area:
  ① When the starting position is set to the upper left or lower right of the printable area using **ESC T**, the vertical motion unit (y) is used.
  ② When the starting position is set to the upper right or lower left of the print able area using **ESC T**, the horizontal motion unit (*x*) is used.

[Reference] **GS P**

ESC K *n*

[Name] Print and reverse feed

[Format]

ASCII	ESC	K	*n*
Hex	1B	4B	*n*
Decimal	27	75	*n*

[Range] $0 \leq n \leq 255$

[Description] Prints the data in the print buffer and feeds the paper $n \times$ vertical motion unit inches in the reverse direction

[Notes]

- Sets the print starting position to the beginning of the line.
- The paper feed amount set by this command does not affect the values set by **ESC 2** or **ESC 3**.
- The horizontal and vertical motion units are specified by **GS P**.
- The **GS P** command can change the vertical (and horizontal) motion units. However, the value cannot be less than the minimum vertical motion amount, and it must be in even units of the minimum vertical motion amount.
- The maximum paper feed amount is 1016 mm {40"}. Even if a paper feed amount of more than 1016 mm {40"} is set, the printer feeds the paper only 1016 mm {40"}.
- In standard mode for slip, the vertical motion unit (y) is used.
- In page mode for slip, this command functions as follows, depending on the starting position of the printable area:
  ① When the starting position is set to the upper left or lower right of the printable area using **ESC T**, the vertical motion unit (y) is used.
  ② When the starting position is set to the upper right or lower left of the print able area using **ESC T**, the horizontal motion unit (*x*) is used.

[Reference] **GS P**

ESC L

[Name] Select page mode

[Format]

ASCII	ESC	L
Hex	1B	4C
Decimal	27	76

[Description] Switches from standard mode to page mode.

[Notes]

- This command is enabled only when processed at the beginning of a line.
- This command has no effect in page mode.
- After printing is completed by **FF** or by using **ESC S**, the printer returns to standard mode.
- This command sets the position where data is buffered to the position specified by **ESC T** within the printing area defined by **ESC W**.
- This command switches the settings for the following commands (in which the values can be set independently in standard mode and page mode) to those for page mode:
  ① Set right-side character spacing: **ESC SP**
  ② Set line spacing: **ESC 2**, **ESC 3**
- Only value settings are possible for the following commands in page mode; these commands are not executed.
  ① Turn 90° clockwise rotation mode on/off: **ESC V**
  ② Select justification: **ESC a**
  ③ Turn upside-down printing mode on/off: **ESC {**
  ④ Set left margin: **GS L**
  ⑤ Set printable area width: **GS W**
  ⑥ Select blocks of print mode (for slip only): **ESC !**
  ⑦ Select character font (for slip only): **ESC M**
- The following command is ignored in page mode:
  ① Execute test print: **GS (A**
- The printer returns to standard mode when power is turned on, the printer is reset, or **ESC** @ is used.
- In page mode, font C is automatically selected regardless of the font selection with the commands.
- In page mode, emphasis and double-stick printing cannot be performed.

[Reference] **FF**, **CAN**, **ESC FF**, **ESC** @, **ESC S**, **ESC T**, **ESC W**, **GS $**, **GS **, 3.12 *Page Mode*

ESC M *n*

[Name] Select character font

[Format]

ASCII	ESC	M	*n*
Hex	1B	4D	*n*
Decimal	27	77	*n*

[Range] *n* = 0, 1, 48, 49

[Description] Selects character font.

n	Function
0, 48	Character font A (9 × 9) selected.
1, 49	Character font B (7 × 9) selected.

[Details]
- **ESC !** can also select character font types. However, the setting of the last received command is effective.

[Reference] **ESC !**

ESC R *n*

[Name] Select an international character set

[Format]

ASCII	ESC	R	*n*
Hex	1B	52	*n*
Decimal	27	82	*n*

[Range] 0 ≤ *n* ≤ 13

[Description] Selects an international character set *n* from the following table:

n	**Character set**
0	U.S.A.
1	France
2	Germany
3	U.K.
4	Denmark I
5	Sweden
6	Italy
7	Spain
8	Japan
9	Norway
10	Denmark II
11	Spain II
12	Latin America
13	Korea

[Default] *n* = 0

[Reference] 3.2.19 *International Character Set*

ESC S

[Name] Select standard mode

[Format]

ASCII	ESC	S
Hex	1B	53
Decimal	27	83

[Description] Switches from page mode to standard mode.

[Notes]

- This command is effective only in page mode.
- Data buffered in page mode is cleared.
- This command sets the print position to the beginning of the line.
- The printing area set by **ESC W** is initialized.
- This command switches the settings for the following commands (in which the values can be set independently in standard mode and page mode) to those for standard mode:
  ① Set right-side character spacing: **ESC SP**
  ② Select default line spacing: **ESC 2**
  ③ Set line spacing: **ESC 3**
- The following commands are enabled only to set in standard mode.
  ① Set printing area in page mode: **ESC W**
  ② Select print direction in page mode: **ESC T**
- The following commands are ignored in standard mode.
  ① Set absolute vertical print position in page mode: **GS $**
  ② Set relative vertical print position in page mode: **GS **
- Standard mode is selected automatically when power is turned on, the printer is reset, or command **ESC** @ is used.

[Reference] **FF**, **ESC FF**, **ESC** @, **ESC L**

ESC T *n*

[Name] Select print direction in page mode

[Format]

ASCII	ESC	T	*n*
Hex	1B	54	*n*
Decimal	27	84	*n*

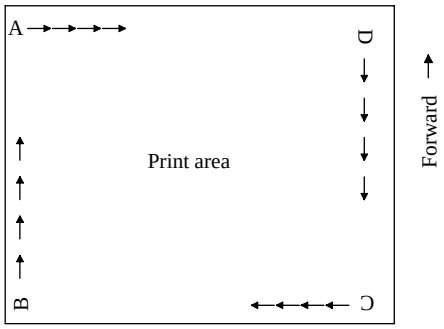
[Range] $0 \le n \le 3$

$48 \le n \le 51$

[Description] Selects the print direction and starting position in page mode.

n specifies the print direction and starting position as follows:

n	**Print Direction**	**Starting Position**
0, 48	Left to right	Upper left (A in the figure)
1, 49	Bottom to top	Lower left (B in the figure)
2, 50	Right to left	Lower right (C in the figure)
3, 51	Top to bottom	Upper right (D in the figure)



[Notes]

- When the command is input in standard mode, the printer executes only internal flag operations. This command does not affect printing in standard mode.
- This command sets the position where data is buffered within the printing area set by **ESC W**.
- Parameters for horizontal or vertical motion units (*x* or *y*) differ as follows, depending on the starting position of the printing area:
  - ① If the starting position is the upper left or lower right of the printing area, data is buffered in the direction perpendicular to the paper feed direction:
    Commands using horizontal motion units: **ESC SP**, **ESC $**, **ESC **
    Commands using vertical motion units: **ESC 3**, **ESC J**, **GS $**, **GS **
  - ② If the starting position is the upper right or lower left of the printing area, data is buffered in the paper feed direction:
    Commands using horizontal motion units: **ESC 3**, **ESC J**, **GS $**, **GS **
    Commands using vertical motion units: **ESC SP**, **ESC $**, **ESC **

[Default] *n* = 0

[Reference] **ESC SP**, **ESC 3**, **ESC $**, **ESC J**, **ESC L**, **ESC W**, **ESC **, **GS $**, **GS P**, **GS **

ESC U *n*

[Name]	Turn on/off unidirectional printing mode			
[Format]	ASCII	ESC	U	*n*
	Hex	1B	55	*n*
	Decimal	27	85	*n*
[Range]	$0 \le n \le 255$			
[Description]	Turns unidirectional printing mode on or off When the LSB is 0, turns off unidirectional printing mode. When the LSB is 1, turns on unidirectional printing mode.			

[Notes]
- Only the least significant bit of *n* is enabled.
- When unidirectional printing mode is turned on, the printer prints from left to right.
- To avoid horizontal printing misalignment, unidirectional printing mode should be used.
- In page mode, unidirectional printing is always selected regardless of the setting of this command.

[Default] *n* = 0

ESC V *n*

[Name] Turn 90° clockwise rotation mode on/off

[Format]

ASCII	ESC	V	*n*
Hex	1B	56	*n*
Decimal	27	86	*n*

[Range] $0 \le n \le 2, 48 \le n \le 50$

[Description] Turns 90° clockwise rotation mode on/off

n is used as follows:

n	**Function**
0, 48	Turns off 90° clockwise rotation mode
1, 49	Turns on 90° clockwise rotation mode (Adjacent dot spacing: 1 dot)
2, 50	Turns on 90° clockwise rotation mode (Adjacent dot spacing: 1.5 dots)

[Notes]

- This command affects printing in standard mode. However, the setting is always effective.
- When underline mode is turned on, the printer does not underline 90° clockwise-rotated text.
- Double-width and double-height commands in 90° rotation mode enlarge characters in the opposite directions from double-height and double-width commands in normal mode.
- The characters which are turned 90° clockwise rotation mode on are printed with font C regardless of the font selection.

[Default] *n* = 0

[Reference] **ESC !, ESC –**

ESC W x_L x_H y_L y_H dx_L dx_H dy_L dy_H

[Name] Set printing area in page mode

[Format]

ASC II	ESC	W	x_L x_H y_L y_H dx_L dx_H dy_L dy_H
Hex	1B	57	x_L x_H y_L y_H dx_L dx_H dy_L dy_H
Decimal	27	87	x_L x_H y_L y_H dx_L dx_H dy_L dy_H

[Range] $0 \le x_L, x_H, y_L, y_H, dx_L, dx_H, dy_L, dy_H \le 255$ (except $dx_L=dx_H=0$ or $dy_L=dy_H=0$)

[Description]

- The horizontal starting position, vertical starting position, printing area width, and printing area height are defined as $x0$, $y0$, dx (inch), dy (inch), respectively.

  Each setting for the printing area is calculated as follows:

  $x0 = [(x_L + x_H \times 256) \times$ (horizontal motion unit)$]$

  $y0 = [(y_L + y_H \times 256) \times$ (vertical motion unit)$]$

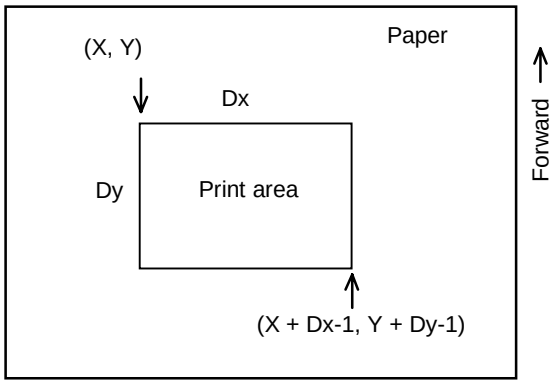
  $dx = [(dx_L + dx_H \times 256) \times$ (horizontal motion unit)$]$

  $dy = [(dy_L + dy_H \times 256) \times$ (vertical motion unit)$]$

  The printing area is set as shown in the figure below.

[Notes]

- If this command is input in standard mode, the printer executes only internal flag operations. This command does not affect printing in standard mode.
- If the horizontal or vertical starting position is set outside the printable area, the printer stops command processing and processes the following data as normal data.
- If the printing area width or height is set to 0, the printer stops command processing and processes the following data as normal data.
- This command sets the position where data is buffered to the position specified by **ESC T** within the printing area.
- If (horizontal starting position + printing area width) exceeds the printable area, the printing area width is automatically set to (horizontal printable area - horizontal starting position).
- If (vertical starting position + printing area height) exceeds the printable area, the printing area height is automatically set to (vertical printable area - vertical starting position).
- The horizontal and vertical motion units are specified by **GS P**. Changing the horizontal or vertical motion unit does not affect the current printing area.
- The **GS P** command can change the horizontal (and vertical) motion units. However, the value cannot be less than the minimum horizontal motion amount, and it must be in even units of minimum horizontal motion amount.
- Use the horizontal motion unit (x) for setting the horizontal starting position and printing area width, and use the vertical motion unit (y) for setting the vertical starting position and printing area height.
- When the horizontal starting position, vertical starting position, printing area width, and printing area height are defined as X, Y, Dx, and Dy respectively, the printing area is set as shown in the figure below.



- For the printable area, refer to Section 6.2, 5) Printable area.

[Default] $xL = xH = yL = yH = 0$
$dxL = 32$, $dxH = 3$, $dyL = 12$, $dyH = 7$

[Reference] **CAN**, **ESC L**, **ESC T**, **GS P**

ESC \ *nL nH*

[Name] Set relative print position

[Format]

ASCII	ESC	\	*nL*	*nH*
Hex	1B	5C	*nL*	*nH*
Decimal	27	92	*nL*	*nH*

[Range] $0 \le n_L \le 255$

$0 \le n_H \le 255$

[Description] Sets the print starting position based on the current position by using the foundamental motion unit.

- This command sets the distance from the current position to [($n_L + n_H$) × 256 × foundamental motion unit]

[Notes]

- Any setting that exceeds the printable area is ignored.
- When pitch *N* is specified to the right:
  $n_L + n_H \times 256 = N$
  When pitch *N* is specified to the left (the negative direction), use the complement of 65536.
  When pitch *N* is specified to the left:
  $n_L + n_H \times 256 = 65536 - N$
- The horizontal and vertical motion unit are specified by **GS P**.
- The **GS P** command can change the horizontal (and vertical) motion unit. However, the value cannot be less than the minimum horizontal movement amount, and it must be in even units of the minimum horizontal movement amount.
- In standard mode, the horizontal motion unit is used.
- In page mode, the horizontal or vertical motion unit differs as follows, depending on the starting point of the printing area:
  ① When the starting position is set to the upper left or lower right of the printable area using **ESC T**, the horizontal motion unit (*x*) is used.
  ② When the starting position is set to the upper right or lower left of the printable area using **ESC T**, the vertical motion unit (*y*) is used.

[Reference] **ESC $**, **GS P**

ESC a *n*

[Name] Select justification

[Format]

ASCII	ESC	a	*n*
Hex	1B	61	*n*
Decimal	27	97	*n*

[Range] $0 \le n \le 2, 48 \le n \le 50$

[Description] Aligns all the data in one line to the specified position

n selects the justification as follows:

n	**Justification**
0,48	Left justification
1, 49	Centering
2, 50	Right justification

[Notes]

- The command is enabled only when processed at the beginning of the line.
- If this command is input in page mode, the printer executes only internal flag operations.
- This command has no effect in page mode.
- This command justifies the space area according to **HT**, **ESC $** or **ESC **.

[Default] *n* = 0

[Example]

Left justification

```
ABC
ABCD
ABCDE
```

Centering

```
 ABC
 ABCD
ABCDE
```

Right justification

```
  ABC
 ABCD
ABCDE
```

ESC c 3 *n*

[Name] Select paper sensor(s) to output paper end signals

[Format]

ASCII	ESC	c	3	*n*
Hex	1B	63	33	*n*
Decimal	27	99	51	*n*

[Range] $0 \le n \le 255$

[Description] Selects the paper sensor(s) to output paper end signals

- Each bit of *n* is used as follows:

Bit	Off/On	Hex	Decimal	Function
0	-	-	-	Undefined
1	-	-	-	Undefined
2	-	-	-	Undefined
3	-	-	-	Undefined
4	Off	00	0	TOF sensor disabled
	On	10	16	TOF sensor enabled
5	Off	00	0	BOF sensor disabled
	On	20	32	BOF sensor enabled
6, 7	-	-	-	Undefined

[Notes]

- It is possible to select multiple sensors to output signals. Then, if any of the sensors detects a paper end, the paper end signal is output.
- Sensor is switched when executing this command. The paper end signal switching be delayed depending on the receive buffer state.
- When all the sensors are disabled, the paper end signal always outputs a paper present status.
- The command is available only with a parallel interface and is ignored with a serial interface.

[Default] *n* = 0

ESC c 4 *n*

[Name] Select paper sensor(s) to stop printing

[Format]

ASCII	ESC	c	4	*n*
Hex	1B	63	34	*n*
Decimal	27	99	52	*n*

[Range] $0 \le n \le 255$

[Description] Selects the paper sensor(s) used to stop printing when a paper-end is detected, using *n* as follows:

Bit	Off/On	Hex	Decimal	Function
0	-	-	-	Undefined
1	-	-	-	Undefined
2	-	-	-	Undefined
3	-	-	-	Undefined
4	Off	00	0	TOF sensor disabled.
	On	10	16	TOF sensor enabled.
5	Off	00	0	BOF sensor disabled.
	On	20	32	BOF sensor enabled.
6	-	-	-	Undefined.
7	-	-	-	Undefined.

[Notes]

- It is possible to select multiple sensors for print control to stop printing. Then if any sensor detects a paper end, the printer stops printing.
- When a paper end is detected, printing is stopped after printing the current line and feeding the paper.
- When the TOF sensor or the BOF sensor is enabled and a paper-end is detected, the printer ejects the paper after printing as much as possible and enters the paper waiting state.
- When a paper-end is detected by the BOF sensor, the printer does not go off-line after printing stops.

[Default] *n* = 0

ESC c 5 *n*

[Name] Enable/disable panel buttons

[Format]

ASCII	ESC	c	5	*n*
Hex	1B	63	35	*n*
Decimal	27	99	53	*n*

[Range] $0 \le n \le 255$

[Description] Enables or disables the panel buttons.

- When the LSB of *n* is 0, the panel buttons are enabled.
- When the LSB of *n* is 1, the panel buttons are disabled.

[Notes]

- Only the lowest bit of *n* is valid.
- When the panel buttons are disabled, none of them are usable.
- In this printer, the panel buttons are the FORWARD, REVERSE, and RELEASE buttons.
- When the cover is open, all panel buttons are disabled regardless of the settings of this command.

[Default] *n* = 0

ESC d *n*

[Name] Print and feed *n* lines

[Format]

ASCII	ESC	d	*n*
Hex	1B	64	*n*
Decimal	27	100	*n*

[Range] $0 \le n \le 255$

[Description] Prints the data in the print buffer and feeds *n* lines.

[Notes]

- This command sets the print starting position to the beginning of the line.
- This command does not affect the line spacing set by **ESC 2** or **ESC 3**.
- The maximum paper feed amount is 1016 mm {40"}. If the paper feed amount (*n* × line spacing) of more than 1016 mm {40"} is specified, the printer feeds the paper only 1016 mm {40"}.

[Reference] **ESC 2**, **ESC 3**

ESC e *n*

[Name] Print and reverse feed *n* lines

[Format]

ASCII	ESC	e	*n*
Hex	1B	65	*n*
Decimal	27	101	*n*

[Range] $0 \le n \le 255$

[Description] Prints the data in the print buffer and feeds *n* lines in the reverse direction.

[Notes]
- This command sets the print starting position to the beginning of the line.
- The paper feed amount set by this command does not affect the values set by **ESC 2** or **ESC 3**.
- Even if the number of ($n \times$ line feed amount) exceeds 1016 mm {40"}, the printer feeds the paper only 1016 mm {40"}.
- In page mode, this command functions as follows, depending on the starting position of the printable area:
  ① When the starting position is set to the upper left or lower right of the printable area using **ESC T**, the print position is set in the same direction with the paper feeding direction (vertical direction for printed characters).
  ② When the starting position is set to the upper right or lower left of the print able area using **ESC T**, the print position is set in the vertical direction to the paper feeding direction (horizontal direction for printed characters).

[Reference] **ESC 2**, **ESC 3**

ESC f *t1 t2*

[Name] Set slip paper waiting time

[Format]

ASCII	ESC	f	*t1*	*t2*
Hex	1B	66	*t1*	*t2*
Decimal	27	102	*t1*	*t2*

[Range] *t1* = 0

$0 \leq t2 \leq 64$

[Description] Sets the time that the printer waits for slip paper to be inserted and the time from insertion of the slip to the start of printing.

- *t1* specifies the wait time for slip paper to be inserted.
- *t2* specifies time from insertion of the slip to the start of printing.

[Notes]

- The printer starts operation [$t2 \times 0.1$] seconds after detecting a slip.
- When either *t1* or *t2* is out of the specified range, this command is ignored and the previously set value is not changed.
- When *t1* is out of the specified range, this command is ignored and the following data is executed normally.
- When the cut sheet insert waiting time is set longer than the default setting, there are a few possibility that the paper jams because the user may insert the paper too much. Therefore, the default setting is recommended to avoid this problem.

[Default] *t1* = 0, *t2* = 5

ESC p *m t1 t2*

[Name] Generate pulse

[Format]

ASCII	ESC	p	*m*	*t1*	*t2*
Hex	1B	70	*m*	*t1*	*t2*
Decimal	27	112	*m*	*t1*	*t2*

[Range] $0 \le m \le 1$, $48 \le m \le 49$

$0 \le t1 \le 255$, $0 \le t2 \le 255$

[Description] Outputs the pulse specified by *t1* and *t2* to connector pin *m* as follows:

m	**Connector pin**
0, 48	Drawer kick-out connector pin 2.
1, 49	Drawer kick-out connector pin 5.

[Notes]
- The pulse ON time is [$t1 \times 2$ ms] and the OFF time is [$t2 \times 2$ ms].
- If $t2 < t1$, the OFF time is [$t1 \times 2$ ms]

[Reference] Section 2.2.3, *Drawer kick-out connector*, Appendix E

ESC q

[Name] Release

[Format]

ASCII	ESC	q
Hex	1B	71
Decimal	27	113

[Description] Releases the paper

[Notes]
- The printer waits for the paper to be removed after executing a release

ESC t *n*

[Name] Select character code table

[Format]

ASCII	ESC	t	*n*
Hex	1B	74	*n*
Decimal	27	116	*n*

[Range] $0 \le n \le 8$, $n = 19$, $n = 255$

[Description] Selects a page *n* from the character code table.

n	**Page**
0	0 (PC437 [U.S.A., Standard Europe])
1	1 (Katakana)
2	2 (PC850 [Multilingual])
3	3 (PC860 [Portuguese])
4	4 (PC863 [Canadian-French])
5	5 (PC865 [Nordic])
6	6 (Hiragana)
7	7 (One-pass printing Kanji characters)
8	8 (One-pass printing Kanji characters)
19 (*1)	19 (PC858 [Euro])
20 (*2)	Thai character code 42
21 (*2)	Thai character code 11
22 (*2)	Thai character code 13
23 (*2)	Thai character code 14
24 (*2)	Thai character code 16
25 (*2)	Thai character code 17
26 (*2)	Thai character code 18
255	Font A: Space page
	Font B: See 3.2.10 Page 255

(*1) Page 19 (PC858) is supported by the ROM version 3.14 or late.

(*2) The character code table (*n* = 20 through 26 is available only on TM-U590 (Thai character supporting model).
Character code table (*n* = 6, 7, and 8) is available only on the Kanji supporting model.

[Default] *n* = 0
For Thai character supporting model: *n* = 20

[Reference] Appendix D, 3.2 *Character Code Tables*

ESC { *n*

[Name] Turns on/off upside-down printing mode

[Format]

ASCII	ESC	{	*n*
Hex	1B	7B	*n*
Decimal	27	123	*n*

[Range] $0 \le n \le 255$

[Description] Turns upside-down printing mode on or off.

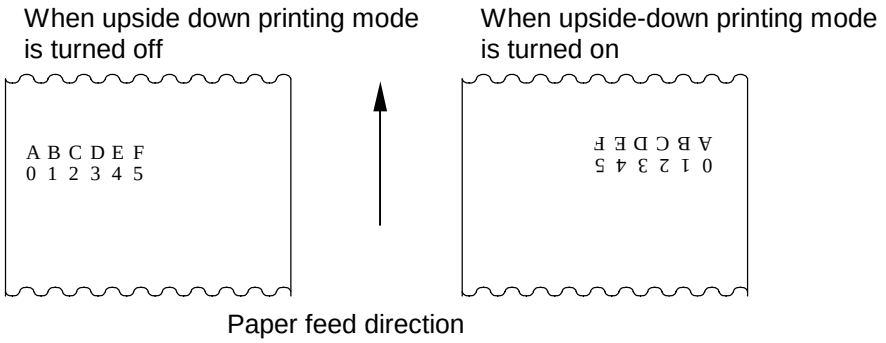
- When the LSB of *n* is 0, upside-down printing mode is turned off.
- When the LSB of *n* is 1, upside-down printing mode is turned on.

[Notes]

- Only the lowest bit of *n* is valid.
- This command is enabled only when processed at the beginning of a line.
- When this command is input in page mode, the printer executes only internal flag operations.
- This command does not affect printing in page mode.
- In upside-down printing mode, the printer rotates the line to be printed by 180° and then prints it.

[Default] *n* = 0

[Example]



GS ! *n*

[Name] Select character size

[Format]

ASCII	GS	!	*n*
Hex	1D	21	*n*
Decimal	29	33	*n*

[Range] *n* = 0, 1, 16, 17

[Description] Selects the character height using bits 0 to 3 and selects the character width using bits 4 to 7, as follows:

Bit	Off/On	Hex	Decimal	Function
0	Character height selection. See Table 2.			
1				
2				
3				
4	Character width selection. See Table 1.			
5				
6				
7				

Table 1 Character Width Selection

Hex	Decimal	Width
00	0	1 (normal)
10	16	2 (double-width)

Table 2 Character Height Selection

Hex	Decimal	Height
00	0	1 (normal)
01	1	2 (double-height)

[Notes]

- In standard mode, the vertical direction is the paper feed direction, and the horizontal direction is perpendicular to the paper feed direction. However, when character orientation changes in 90° clockwise-rotation mode, the relationship between vertical and horizontal directions is reversed.
- In page mode, vertical and horizontal directions are based on the character orientation.
- When characters are enlarged with different sizes on one line, all the characters on the line are aligned at the baseline.
- The **ESC !** command can also turn double-width and double-height modes on or off. However, the setting of the last received command is effective.

[Default] *n* = 0

[Reference] **ESC !**

GS $ *nL nH*

[Name] Set absolute vertical print position in page mode

[Format]

ASCII	GS	$	*nL* *nH*
Hex	1D	24	*nL* *nH*
Decimal	29	36	*nL* *nH*

[Range] $0 \le n_L \le 255$, $0 \le n_H \le 255$

[Description]
- Sets the absolute vertical print starting position for buffer character data in page mode.
- This command sets the absolute print position to [($n_L + n_H \times 256$) × (vertical or horizontal motion unit)] inches.

[Notes]
- This command is effective only in page mode.
- If the [($n_L + n_H \times 256$) × (vertical or horizontal motion unit)] exceeds the specified printing area, this command is ignored.
- The horizontal starting buffer position does not move.
- The horizontal and vertical motion units are specified by **GS P**.
- The **GS P** command can change the horizontal and vertical motion unit. However, the value cannot be less than the minimum horizontal motion amount, and it must be in even units of the minimum horizontal motion amount.
- The reference starting position is that specified by **ESC T**.
- This command operates as follows, depending on the starting position of the printing area specified by **ESC T**:
  ① When the starting position is set to the upper left or lower right, this command sets the absolute position in the vertical direction.
  ② When the starting position is set to the upper right or lower left, this command sets the absolute position in the horizontal direction.

[Reference] **ESC $**, **ESC T**, **ESC W, ESC **, **GS P, GS **, 3.12 *Page Mode*

GS ∗ *x y d1 ... d(x × y × 8)*

[Name] Define user-defined bit-image

[Format]

ASCII	GS	∗	*x*	*y*	*d1 ... d(x × y × 8)*
Hex	1D	2A	*x*	*y*	*d1 ... d(x × y × 8)*
Decimal	29	42	*x*	*y*	*d1 ... d(x × y × 8)*

[Range] $1 \le x \le 255$

$1 \le y \le 255$

$x \times y \le 404$

$0 \le d \le 255$

[Description] Defines a user-defined bit-image using the number of dots specified by *x* and *y*

- *x* specifies the number of dots in the horizontal direction.
- *y* specifies the number of dots in the vertical direction.

[Notes]

- The number of dots in the horizontal direction is x × 8, in the vertical direction it is y × 8.
- If *x* × *y* is out of the specified range, this command is disabled.
- The *d* indicates bit-image data. Data (*d*) specifies a bit printed to 1 and not printed to 0.
- A user-defined character and a user-defined bit-image cannot be defined simultaneously. When this command is executed, the user-defined character is cleared.
- After a user-defined bit-image is defined, it is available until **ESC** @ or **ESC &** is executed; the printer is reset; or the power is turned off.

[Reference] **ESC &**, **GS *l***

GS (A *pL pH n m*

[Name] Execute test print

[Format]

ASCII	GS	(	A	*pL*	*pH*	*n*	*m*
Hex	1D	28	41	*pL*	*pH*	*n*	*m*
Decimal	29	40	65	*pL*	*pH*	*n*	*m*

[Range] $(p_L+(p_H\times256))=2$ (where $p_L=2$, $p_H=0$)
$n = 0, 48, 3 \le n \le 4, 51 \le n \le 52$
$1 \le m \le 3, 49 \le m \le 51$

[Description]
- Executes a test print with a specified test pattern on the specified paper.
- p_L and p_H specifies the number of parameters such as n, m as $(p_L + (p_H \times 256))$ bytes.

n specifies the paper to be tested.

n	Paper
0, 48	Basic sheet (Slip)
3, 51 4, 52	Slip

m specifies a test pattern.

m	Test pattern
1, 49	Hexadecimal dump
2, 50	Printer status print
3, 51	Rolling pattern print

[Notes]
- This command is enabled only when processed at the beginning of a line in standard mode.
- This command has no effect in page mode.
- After the test print is finished, the printer resets itself automatically. Therefore, the already-defined data before this command is executed, such as an user-defined characters, and downloaded bit image, becomes undefined, and the receive buffer and print buffer are cleared, and each setting returns to the default value. The printer also re-reads the DIP switch settings.
- At the end of the test print, ejects the cut sheet when cut sheet is selected.
- When slip is selected, this command is executed after the ejection of the paper.
- The printer goes BUSY while this command is executed.

GS / *m*

[Name] Print user-defined bit-image

[Format]

ASCII	GS	/	*m*
Hex	1D	2F	*m*
Decimal	29	47	*m*

[Range] *m* = 0, 1, 48, 49 (in standard mode)
m = 1, 49 (in page mode)

[Description] Prints a user-defined bit-image using the mode specified by *m*.
m selects a mode from the table below:

m	**Mode**	**Vertical Dot Density (DPI)**	**Maximum Number of Dots in Horizontal**
0, 48	Normal	Not available	800 dots
1, 49	Double-width	Available	400 dots

[Notes]

- This command is ignored if a user-defined bit-image has not been defined.
- In standard mode, this command is effective only when there is no data in the print buffer.
- This command has no effect in the print modes (emphasized, double-strike, underline, character size, or 90° rotated character etc.), except for upside-down printing mode.
- If the downloaded bit image to be printed exceeds the printable area, the excess data is not printed.
- Refer to Figure 3.12.2 for the downloaded bit image development position in page mode.
- If the printing area width set by **GS L** and **GS W** is less than one line in vertical, the following processing is performed only on the line in question:
  ① The printing area width is extended to the right up to one line in vertical. In this case, printing does not exceed the printable area.
  ② If the printing area width cannot be extended by one line in vertical, the left margin is reduced to accommodate one line in vertical.

  One line in vertical means 1 dot (one half dot for the slip) in normal (*m* = 0, 48) and double-height (2, 50), 2 dots (two half dot for the slip) in double-width (*m* = 1, 49) and quadruple (*m* = 3, 51) modes.

[Reference] **GS ∗**

GS I *n*

[Name] Transmit printer ID

[Format]

ASCII	GS	I	*n*
Hex	1D	49	*n*
Decimal	29	73	*n*

[Range] $1 \le n \le 3, 49 \le n \le 51$

[Description] Transmits the printer ID specified by *n* as follows:

n	**Printer ID**	**Specification**	**ID (hexadecimal)**
1, 49	Printer model ID	TM-U590/U590P	21H
2, 50	Type ID	See table below.	
3, 51	ROM version ID	Depends on ROM version	

n = 2, 50 Type ID

Bit	**Off/On**	**Hex**	**Decimal**	**Function**
0	Off	00	0	Two-byte character code not supported.
	On	01	1	Two-byte character code supported.
1	Off	00	0	Autocutter is not equipped.
2	Off	00	0	Customer display is not connected directly. (DIP switch 2-2 is set to Off)
	On	04	4	Customer display is connected directly. (DIP switch 2-2 is set to On)
3	Off	00	0	No MICR reader.
4	Off	00	0	Not used. Fixed to Off.
5	-	-	-	Undefined.
6	-	-	-	Undefined.
7	Off	00	0	Not used. Fixed to Off.

[Notes]

- When DTR/DSR control is selected in the serial interface model, the printer transmits only 1 byte after confirming that the host is ready to receive data (DSR signal is SPACE). If the host computer is not ready to receive data (DSR signal is MARK), the printer waits until the host is ready.
- When XON/XOFF control is selected in the serial interface model, the printer transmits only 1 byte without confirming the condition of the DSR signal.
- The printer ID is transmitted when the data in the receive buffer is developed. Therefore, there may be a time lag between receiving this command and transmitting the status, depending on the receive buffer status.
- When Auto Status Back (ASB) is enabled using **GS a**, the status transmitted by **GS I** and the ASB status must be differentiated.

[Reference] Appendix C

GS L *nL nH*

[Name] Set left margin

[Format]

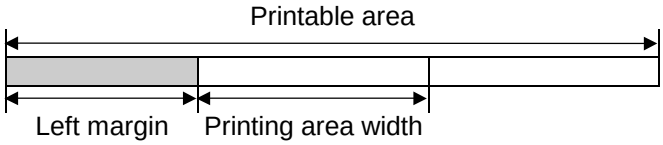
ASCII	GS	L	*nL*	*nH*
Hex	1D	4C	*nL*	*nH*
Decimal	29	76	*nL*	*nH*

[Range] $0 \le n_L \le 255$

$0 \le n_H \le 255$

[Description] Sets the left margin using *nL* and *nH*.

- The left margin is set to [(*nL* + *nH* × 256) × horizontal motion unit)] inches.



[Notes]

- If this command is input in page mode, the printer executes only internal flag operations.
- This command does not affect printing in page mode.
- This command is effective only processed at the beginning of the line.
- If the setting exceeds the printable area, the maximum value of the printable area is used.
- The horizontal and vertical motion units are specified by **GS P**. Changing the horizontal and vertical motion unit does not affect the current left margin.
- The horizontal motion unit (*x*) is used for calculating the left margin. The calculated result is truncated to the minimum value of the mechanical pitch.

[Default] *nL* = 0, *nH* = 0

[Reference] **GS P**, **GS W**

GS P *x y*

[Name] Set horizontal and vertical motion units

[Format]

ASCII	GS	P	*x*	*y*
Hex	1D	50	*x*	*y*
Decimal	29	80	*x*	*y*

[Range] $0 \le x \le 255$

$0 \le y \le 255$

[Description] Sets the horizontal and vertical motion units to approximately 25.4/*x* mm {1/*x*"} and approximately 25.4/*y* mm {1/*y*"}, respectively.

When *x* and *y* are set to 0, the default setting of each value is used.

[Notes]

- The horizontal direction is perpendicular to the paper feed direction and the vertical direction is the paper feed direction.
- In standard mode, the following commands use *x* or *y*, regardless of character rotation (upside-down or 90° clockwise rotation):
  ① Commands using *x*: **ESC SP**, **ESC $**, **ESC **, **FS S, GS L**, **GS W**
  ② Commands using *y*: **ESC 3**, **ESC J**, **ESC K**
- In page mode, the following commands use *x* or *y*, depending on character orientation:
  ① When the print starting position is set to the upper left or lower right of the printing area using **ESC T** (data is buffered in the direction perpendicular to the paper feed direction):
  Commands using *x*: **ESC SP**, **ESC $**, **ESC W**, **ESC \, FS S**
  Commands using *y*: **ESC 3**, **ESC J**, **ESC W**, **GS $** , **GS **
  ② When the print starting position is set to the upper right or lower left of the printing area using **ESC T** (data is buffered in the paper feed direction):
  Commands using *x*: **ESC 3**, **ESC J**, **ESC W**, **GS $**, **GS **
  Commands using *y*: **ESC SP**, **ESC $**, **ESC W**, **ESC **, **FS S**
- The command does not affect the previously specified values.
- The calculated result from combining this command with others is truncated to the minimum value of the mechanical pitch.

[Default] *x* = 150, *y* = 144

[Reference] **ESC SP**, **ESC $**, **ESC 3**, **ESC J**, **ESC K**, **ESC **, **FS S**, **GS L**, **GS W**

GS W *nL nH*

[Name] Set printing area width

[Format]

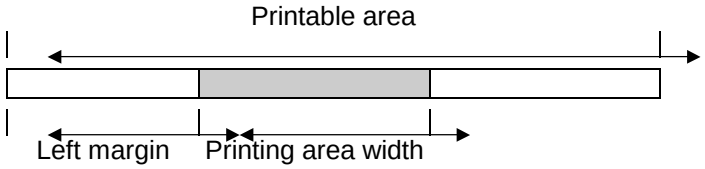
ASCII	GS	W	*nL*	*nH*
Hex	1D	57	*nL*	*nH*
Decimal	29	87	*nL*	*nH*

[Range] $0 \le n_L \le 255$

$0 \le n_H \le 255$

[Description] Sets the printing area width to the area specified by *nL* and *nH*.

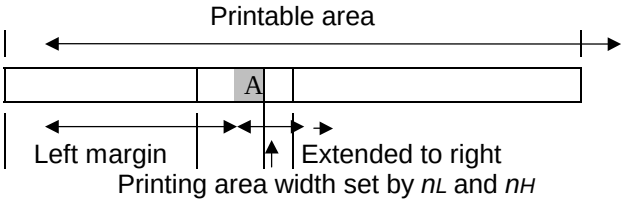
- The printing area width is set to [(*nL* + *nH* × 256) × horizontal motion unit)] inches.



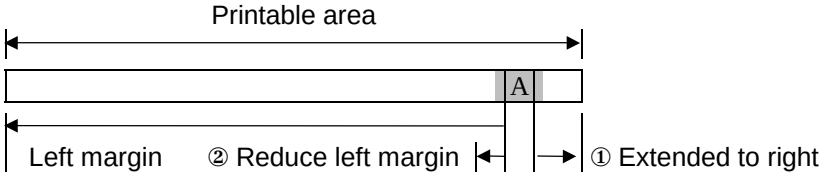
[Notes]

- This command is effective only processed at the beginning of the line.
- If this command is input in page mode, the printer executes only internal flag operations.
- This command does not affect printing in page mode.
- If the [left margin + printing area width] exceeds the printable area, [printable area width - left margin) is used.
- The horizontal and vertical motion units are specified by **GS P**. Changing the horizontal and vertical motion units does not affect the current left margin.
- The horizontal motion unit (*x*) is used for calculating the printing area width. The calculated result is truncated to the minimum value of the mechanical pitch.
- If the width set for the printing area is less than the width of one character, when the character data is developed, the following processing is performed:

  ① The printing area width is extended to the right to accommodate one character.



② If the printing area width cannot be extended sufficiently, the left margin is reduced to accommodate one character.



③ If the printing area width cannot be extended sufficiently, the right space is reduced.

- If the width set for the printing area is less than one line in vertical, the following processing is performed only on the line in question when data other than character data (e.g., bit image, user-defined bit image) is developed:

  ① The printing area width is extended to the right to accommodate one line in vertical for the bit image within the printable area.

  ② If the printing area width cannot be extended sufficiently, the left margin is reduced to accommodate one line in vertical.

[Default] n_L = 32, n_H = 3

[Reference] **GS L**, **GS P**

GS \ *nL nH*

[Name]	Set relative vertical print position in page mode				
[Format]	ASCII	GS	\	*nL*	*nH*
	Hex	1D	5C	*nL*	*nH*
	Decimal	29	92	*nL*	*nH*

[Range] $0 \le n_L \le 255$
$0 \le n_H \le 255$

[Description] Sets the relative vertical print starting position from the current position in page mode.

- This command sets the distance from the current position to [($n_L + n_H \times 256$) $\times$ vertical or horizontal motion unit] inches.

[Notes]
- This command is ignored unless page mode is selected.
- When pitch *N* is specified for the movement downward:
  $n_L + n_H \times 256 = N$
  When pitch *N* is specified for the movement upward (the negative direction), use the complement of 65536.
  When pitch *N* is specified for the movement upward:
  $n_L + n_H \times 256 = 65536 - N$
- Any setting that exceeds the specified printing area is ignored.
- The horizontal and vertical motion units are specified by **GS P**.
- The **GS P** command can change the horizontal (and vertical) motion units. However, the value cannot be less than the minimum horizontal motion amount, and it must be in even units of the minimum horizontal motion amount.
- This command functions as follows, depending on the print starting position set by **ESC T**:
  ① When the starting position is set to the upper left or lower right of the printing, the vertical motion unit (y) is used.
  ② When the starting position is set to the upper right or lower left of the printing area, the horizontal motion unit (x) is used.

[Reference] **ESC $**, **ESC T**, **ESC W**, **ESC **, **GS $**, **GS P**, 3.12 *Page Mode*

GS a *n*

[Name] Enable/Disable Automatic Status Back (ASB)

[Format]

ASCII	GS	a	*n*
Hex	1D	61	*n*
Decimal	29	97	*n*

[Range] $0 \le n \le 255$

[Description] Enables or disables ASB and specifies the status items to include, using *n* as follows:

Bit	Off/On	Hex	Decimal	Status for ASB
0	Off	00	0	Drawer kick-out connector pin 3 status disabled.
	On	01	1	Drawer kick-out connector pin 3 status enabled.
1	Off	00	0	Online/offline status disabled.
	On	02	2	Online/offline status enabled.
2	Off	00	0	Error status disabled.
	On	04	4	Error status enabled.
3	-	-	-	Undefined.
4	-	-	-	Undefined.
5	Off	00	0	Slip paper sensor status disabled.
	On	20	32	Slip paper sensor status enabled.
6	-	-	-	Undefined.
7	-	-	-	Undefined.

[Notes]

- If any of the status items in the table above are enabled, the printer transmits the status when this command is executed. The printer automatically transmits the status whenever the enabled status item changes. The disabled status items may change, in this case, because each status transmission represents the current status.
- If all status items are disabled, the ASB function is also disabled.
- If the ASB is enabled as a default, the printer transmits the status when the printer data reception and transmission is possible at the first time from when the printer is turned on.
- The following four status bytes are transmitted without confirming whether the host is ready to receive data. The four status bytes must be consecutive, except for the XOFF code.
- Since this command is executed after the data is processed in the receive buffer, there may be a time lag between data reception and status transmission.
- When the printer is disabled by **ESC =** (Select peripheral device), the four status bytes are transmitted whenever the status changes.

- When using **DLE EOT**, **GS I**, or **GS r**, the status transmitted by these commands and ASB status must be differentiated, according to the procedure in Appendix C, *Transmission Status Identification*.
- The status to be transmitted are as follows:

First byte (printer information)

Bit	Off/On	Hex	Decimal	Status for ASB
0	Off	00	0	Not used. Fixed to Off.
1	Off	00	0	Not used. Fixed to Off.
2	Off	00	0	Drawer kick-out connector pin 3 is LOW.
	On	04	4	Drawer kick-out connector pin 3 is HIGH.
3	Off	00	0	Online.
	On	08	8	Offline.
4	Off	10	16	Not used. Fixed to Off.
5	Off	00	0	Cover is closed.
	On	20	32	Cover is open.
6	Off	00	0	Paper is not being fed by using the FORWARD/REVERSE button.
	On	40	64	Paper is being fed by using the FORWARD/REVERSE button.
7	Off	00	0	Not used. Fixed to Off.

Bit5: When the printer cover is open during printing, the printer is in the recoverable error.

Second byte (printer information)

Bit	Off/On	Hex	Decimal	Status for ASB
0	-	-	-	Undefined.
1	-	-	-	Undefined.
2	Off	00	0	No mechanical error.
	On	04	4	Mechanical error occurred.
3	-	-	-	Undefined.
4	Off	00	0	Not used. Fixed to Off.
5	Off	00	0	No unrecoverable error.
	On	20	32	Unrecoverable error occurred.
6	-	-	-	Undefined.
7	Off	00	0	Not used. Fixed to Off.

Bit 2: Mechanical error indicates the home position detection error, carriage detection error, slip paper ejection error, or slip cover open error during printing.

If these errors occur due to paper jams or the like, it is possible to recover by correcting the cause of the error and executing **DLE ENQ *n*** ($1 \leq n \leq 2$). If an error due to a circuit failure (e.g. wire break) occurs, it is impossible to recover.

Third byte (paper sensor information)

Bit	Off/On	Hex	Decimal	Status for ASB
0	-	-	-	Undefined.
1	-	-	-	Undefined.
2	-	-	-	Undefined.
3	-	-	-	Undefined.
4	Off	00	0	Not used. Fixed to Off.
5	Off	00	0	TOF sensor: paper present.
	On	20	32	TOF sensor: paper not present.
6	Off	00	0	BOF sensor: paper present.
	On	40	64	BOF sensor: paper not present.
7	Off	00	0	Not used. Fixed to Off.

Fourth byte (paper sensor information)

Bit	Off/On	Hex	Decimal	Status for ASB
0	Off	00	0	Slip is selected.
1	Off	00	0	Can print on slip.
	On	02	2	Cannot print on slip.
2, 3	-	-	-	Undefined.
4	Off	00	0	Not used. Fixed to Off.
5, 6	-	-	-	Undefined.
7	Off	00	0	Not used. Fixed to Off.

Bit 1:
- Bit 1 is 0 when the slip is set (can print) and Bit 1 is 1 when the slip ejection starts (cannot print).
- When printing stop due to paper end of a slip is disabled by **ESC c 4**, if there is no printable area on the slip, Bit 1 of fourth byte is not On (cannot print on slip). Check if there is printing area on the slip by using **GS r 3**.

[Default] *n* = 0 when DIP SW 2-1 is off, *n* = 2 when DIP SW 2-1 is on.

[Reference] **DLE EOT**, **ESC c 4**, **GS r**, **FS a**, Appendix C

GS r *n*

[Name] Transmit status

[Format]

ASCII	GS	r	*n*
Hex	1D	72	*n*
Decimal	29	114	*n*

[Range] $1 \le n \le 3, 49 \le n \le 51$

[Description] Transmits the status specified by *n* as follows:

n	Function
1, 49	Transmits paper sensor status
2, 50	Transmits drawer kick-out connector status
3, 51	Transmits slip status

[Notes]

- When using a serial interface
  When DTR/DSR control is selected, the printer transmits only 1 byte after confirming the host is ready to receive data (DSR signal is SPACE). If the host computer is not ready to receive data (DSR signal is MARK), the printer waits until the host is ready.
  When XON/XOFF control is selected, the printer transmits only 1 byte without confirming the condition of the DSR signal.
- This command is executed when the data in the receive buffer is developed. Therefore, there may be a time lag between receiving this command and transmitting the status, depending on the receive buffer status.
- When Auto Status Back (ASB) is enabled using **GS a**, the status transmitted by **GS r** and the ASB status must be differentiated using the table in Appendix C.
- The status types to be transmitted are shown below:

Paper sensor status (*n* = 1, 49):

Bit	Off/On	Hex	Decimal	Status for ASB
0	-	-	-	Undefined.
1	-	-	-	Undefined.
2	-	-	-	Undefined.
3	-	-	-	Undefined.
4	Off	00	0	Not used. Fixed to Off.
5	Off	00	0	TOF sensor: paper present.
	On	20	32	TOF sensor: paper not present.
6	Off	00	0	BOF sensor: paper present.
	On	40	64	BOF sensor: paper not present.
7	Off	00	0	Not used. Fixed to Off.

Drawer kick-out connector status (*n* = 2, 50):

Bit	Off/On	Hex	Decimal	Function
0	Off	00	0	Drawer kick-out connector pin 3 is LOW.
	On	01	1	Drawer kick-out connector pin 3 is HIGH.
1-3	-	-	-	Undefined.
4	Off	00	0	Not used. Fixed to Off.
5, 6	-	-	-	Undefined.
7	Off	00	0	Not used. Fixed to Off.

Slip Status (*n* = 3, 51)

The remaining print area (times of the number of dots in vertical for one character) is transmitted as values from 00H to 06H.

The number of remaining dots	Slip status
0 - 8	00H
9 - 17	01H
18 - 26	02H
27-35	03H
36 - 44	04H
45 - 53	05H
54 or more	06H

[Reference] **DLE EOT**, **GS a**, Appendix C

6.4 Kanji Control Commands (only for Japanese, Simplified Chinese, Traditional Chinese Model)

FS ! *n*

[Name] Set print mode(s) for Kanji characters

[Format]

ASCII	FS	!	*n*
Hex	1C	21	*n*
Decimal	28	33	*n*

[Range] $0 \le n \le 255$

[Description] Sets the print mode for Kanji characters, using *n* as follows:

Bit	Off/On	Hex	Decimal	Function
0	-	-	-	Undefined.
1	-	-	-	Undefined.
2	Off	00	0	Double-width mode is OFF.
	On	04	4	Double-width mode is ON.
3	Off	00	.	Double-height mode is OFF.
	On	08	8	Double-height mode is ON.
4	-	-	-	Undefined.
5	-	-	-	Undefined.
6	-	-	-	Undefined.
7	Off	00	0	Underline mode is OFF.
	On	80	128	Underline mode is ON.

[Notes]
- When both double-width and double-height modes are set (including right- and left-side character spacing), quadruple-size characters are printed.
- The printer can underline all characters (including right- and left-side character spacing), but cannot underline the space set by **HT**.
- The thickness of the underline is that specified by **FS -**, regardless of the character size.
- When some of the characters in a line are double or more height, all the characters on the line are aligned at the baseline.
- It is possible to emphasize the Kanji character using **FS W** or **GS !**, the setting of the last received command is effective.
- It is possible to turn under line mode on or off using **FS -**, and the setting of the last received command is effective.

[Default] *n* = 0

[Reference] **FS -**, **FS W**, **GS !**

FS &

[Name] Select Kanji character mode

[Format]

ASCII	FS	&	
Hex	1C	26	
Decimal	28	38	

[Description] Selects Kanji character mode.

[Notes]
- When the Kanji character code system is SHIFT JIS, the printer performs only internal flag operations. Printing is not affected.
- Kanji character mode is not selected when the power is turned on.
- Kanji codes are processed in the order of the first byte and second byte.

[Reference] **FS .**, **FS C**

FS - *n*

[Name] Turn underline mode on/off for Kanji characters

[Format]

ASCII	FS	-	*n*
Hex	1C	2D	*n*
Decimal	28	45	*n*

[Range] $0 \le n \le 1$, $48 \le n \le 49$

[Description] Turns underline mode for Kanji characters on or off, based on the following values of n:

n	**Function**
0, 48	Turns off underline mode for Kanji characters
1, 49	Turns on underline mode for Kanji characters (1-dot thick)

[Notes]
- The printer can underline all characters (including right- and left-side character spacing), but cannot underline the space set by **HT**.
- Changing the character size does not affect the current underline thickness.
- It is possible to turn underline mode on or off using **FS !**, and the last received command is effective.

[Default] *n* = 0

[Reference] **FS !**

FS .

[Name] Cancel Kanji character mode

[Format]

ASCII	FS	.
Hex	1C	2E
Decimal	28	46

[Description] Cancels Kanji character mode.

[Notes]
- When the Kanji character code system is SHIFT JIS, the printer performs only internal flag operations. Printing is not affected.
- Kanji character mode is not the default setting.

[Reference] **FS &**, **FS C**

FS 2 *c1 c2 d1...dk*

[Name] Define user-defined Kanji characters

[Format]

ASCII	FS	2	*c1*	*c2*	*d1...dk*
Hex	1C	32	*c1*	*c2*	*d1...dk*
Decimal	28	50	*c1*	*c2*	*d1...dk*

[Range] When the JIS code system is specified:

c1 = <77>H
<21>H ≤ *c2* ≤ <7E>H
0 ≤ *d* ≤ 255
k = 32

When the SHIFT JIS code system is specified:

c1 = <EC>H
<40>H ≤ *c2* ≤ <7E>H and <80>H ≤ *c2* ≤ <9E>H
0 ≤ *d* ≤ 255
k = 32

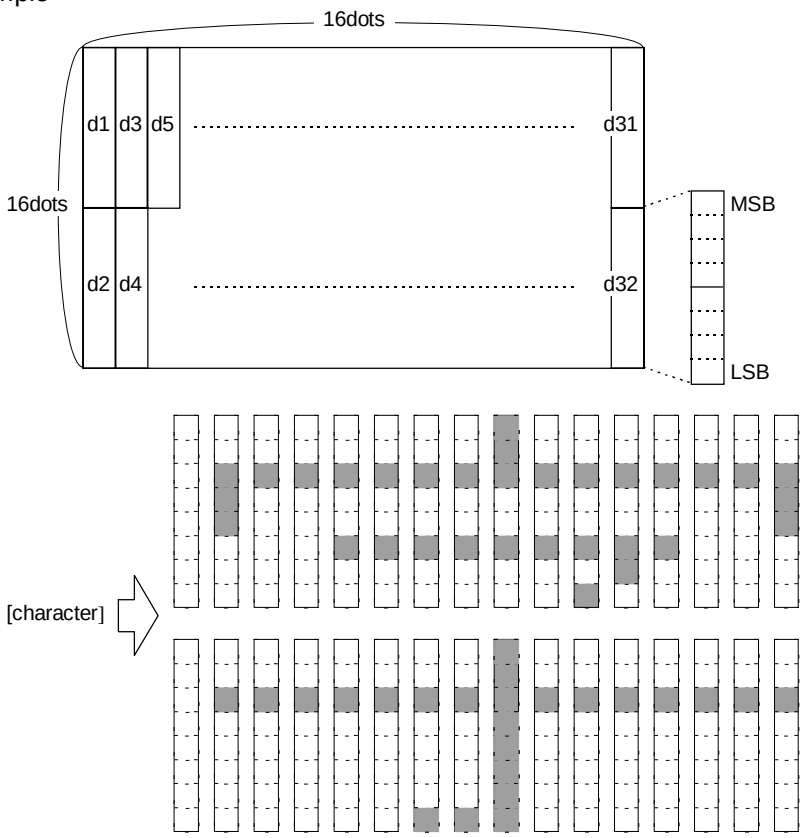
[Description] Defines user-defined Kanji characters for the character codes specified by *c1* and *c2.*

[Notes]
- *c1* and *c2* indicate character codes for the defined characters. The range of values for *c1* and *c2* differ depending on the character code system used.
- *d* indicates the dot data. Set a corresponding bit to 1 to print a dot or to 0 to not print a dot.

[Default] All spaces.

[Reference] **FS C**

<Example>



When the dot pattern for JIS code <7721>H is defined as shown above.

	FS	2	c1	c2	d1	d2	d3	d4	d5	d6	d7	d8	d9	d10	d11	d12
Code (Hex)	IC	32	77	21	00	00	38	20	20	20	20	20	24	20	24	20

d13	d14	d15	d16	d17	d18	d19	d20	d21	d22	d23	d24	d25	d26	d27	d28	d29
24	21	24	21	E4	FF	24	20	25	20	26	20	24	20	20	20	20

d30	d31	d32
20	38	20

The corresponding bit is 1 when printing and 0 when not printing.

FS C *n*

[Name] Select Kanji character code system

[Format]

ASCII	FS	C	*n*
Hex	1C	43	*n*
Decimal	28	67	*n*

[Range] *n* = 0, 1, 48, 49

[Description] Selects a Kanji character code system, based on the following values of *n*:

n	**Kanji System**
0, 48	JIS code
1, 49	SHIFT JIS code

[Notes]
- In the JIS code system, the following codes are available:
  Primary byte: <21>H to <7E>H
  Secondary byte: <21>H to <7E>H
- In the SHIFT JIS code system, the following codes are available:
  Primary byte: <81>H to <9F>H and <E0>H to <EF>H
  Secondary byte: <40>H to <7E>H and <80>H to <FC>H

[Default] *n* = 0

FS S *n1 n2*

[Name] Set left- and right-side Kanji character spacing

[Format]

ASCII	FS	S	*n1*	*n2*
Hex	1C	53	*n1*	*n2*
Decimal	28	83	*n1*	*n2*

[Range] $0 \le n1 \le 255$
$0 \le n2 \le 255$

[Description] Sets left- and right-side Kanji character spacing *n1* and *n2*, respectively.

- When the printer model used supports **GS P**, the left-side character spacing is [*n1* × horizontal or vertical motion units] inches, and the right-side character spacing is [*n2* × horizontal or vertical motion units] inches.

[Notes]

- When double-width mode is set, the left- and right-side character spacing is twice the normal value.
- The horizontal and vertical motion units are set by **GS P**. The previously specified character spacing does not change, even if the horizontal or vertical motion unit is changed using **GS P**.
- The value cannot be less than the minimum horizontal movement amount, and must be in even units of the minimum horizontal movement amount.

[Default] *n1* = 0, *n2* = 0

[Reference] **GS P**

FS W *n*

[Name] Turn quadruple-size mode on/off for Kanji characters

[Format]

ASCII	FS	W	*n*
Hex	1C	57	*n*
Decimal	28	87	*n*

[Range] $0 \le n \le 255$

[Description] Turns quadruple-size mode on or off for Kanji characters.

- When LSB of *n* is 0, quadruple-size mode for Kanji characters is turned off.
- When LSB of *n* is 1, quadruple-size mode for Kanji characters is turned on.

[Notes]

- Only the lowest bit of *n* is valid.
- In quadruple-size mode, the printer prints the same size characters as when double-width and double-height modes are both turned on.
- When quadruple-size mode is turned off using this command, the following characters are printed in normal size.
- When some of the characters on a line are different in height, all the characters on the line are aligned at the baseline.
- When characters are enlarged in the horizontal direction, they are enlarged to the right, based on the left side of the character.
- **FS !** or **GS !** can also select and cancel quadruple-size mode by selecting double-height and double-width modes, and the setting of the last received command is effective.

[Default] *n* = 0

[Reference] **FS !**, **GS !**

APPENDIX A: MISCELLANEOUS NOTES

A.1 Notes on Printing and Paper Feeding

1) Print duty

- When printing exceeds the allowable print duty cycle, the printer automatically senses the status and controls printing (both for receipt and slip). In this case, the printing speed may slow temporarily. When print duty is lowered to normal, the printing speed also returns to normal.

2) Inserting slip paper

Slip paper should be inserted correctly by matching the top edge with the form stopper and the right side with the right side of the paper insert portion.

If the paper is not straight, the sensors (TOF and BOF sensors) cannot detect it. The paper cannot be clamped.

As soon as the paper is engaged by the paper feed roller and the print head, immediately let go of it.

3) Printing on slip paper

- Slip paper can be ejected in both forward (default) and backward directions. However, for small paper, ejecting in the forward direction is recommended.
- Slip paper should be inserted correctly by matching the top edge with the form stopper and the right side with the right side of the paper insert portion.
- The slip waiting time and the interval from when slip is inserted to when the operation starts can be set using **ESC f**.
- After the slip is ejected, the SLIP LED indicator lights and the printer does not proceed to the next operation until the slip paper is removed.
- The remaining printing space for printing the following data on slip can be checked using **GS r 3**.
- Printing with the ejection of the slip paper toward you is prohibited. Doing so may cause paper jams and ink-stained paper.
- Do not execute a mechanical reset with the slip paper inserted. Doing so may cause the paper edge to be caught by the print head carriage.
- Be sure to turn on the power with no slip paper inserted. Otherwise, the paper may be caught by the print head carriage.

ASB function is recommended to check the slip status.

A.2 Notes on Printer Installation

1) When transporting the TM-U590 series printer, the dampers are in the left side of the slip section and in the bottom of the paper roll section. Therefore, remove the dampers before using the printer.

2) Connect the external power supply to the power supply connector of the printer. Then plug in the external power supply and turn it on if necessary. Be sure not to connect the external power supply with the wrong polarity. If it is connected incorrectly, the internal circuit fuse of the printer may be blown or the external power supply may be damaged.

   - The power supply voltage is within the range of 24 V ± 10% (21.6 ~ 26.4V)

   If the power supply voltage drops to the outside of the range above during printing, the printer stops printing and waits until the voltage returns to normal and then automatically begins printing again. Therefore, printing speed may slow, the print pitch may not be correct, and some dots in some characters may not be printed.

   - When the power supply voltage exceeds 26.4V for a certain time continuously, it is a high voltage error. When the voltage is below 21.6V for a certain time continuously, it is a low voltage error.
   - Both high and low voltage errors are shown in Table 3.7.3. The blinking patterns are shown in the table.
   - When either a high or low voltage error occurs, turn off the power as soon as possible.

A.3 Other Notes

- Because this printer uses plated steel, the cutting edges may be subject to rust. However, this does not affect the printer performance.
- When you move the printer, put your hand under the printer so that you do not apply excessive pressure to the printer case.
- Do not set any liquids or drinks such as coffee on the printer case.

APPENDIX B: REPLACING THE RIBBON CASSETTE

1) Turn off the power.
2) Pull the front cover toward you and lift it up.
3) Remove the ribbon cassette.
4) Make sure that the print head is on the right side and turn the feed knob to take up any slack in the ribbon. Then insert the new ribbon cassette.

   (Note that if the ribbon is not correctly placed in the ribbon guide, when you insert slip paper it may catch on the ribbon or become stained with ink from the ribbon.)
5) Push the front cover down and back.

APPENDIX C: TRANSMISSION STATUS IDENTIFICATION

Because the specified status bits transmitted from the TM-U590 series printer are fixed, the user can confirm the command to which the status belongs, as shown in the following table.

Command & Function	Status Reply
GS I	<0∗∗0∗∗∗∗>B
GS r	<0∗∗0∗∗∗∗>B
XON	<00010001>B
XOFF	<00010011>B
DLE EOT 1~5	<0∗∗1∗∗10>B
ASB (1st byte)	<0∗∗1∗∗00>B
ASB (2nd to 4th bytes)	<0∗∗0∗∗∗∗>B

APPENDIX D: CONFIGURING THE SPACE PAGE

The space page is the character code table where character codes 80H to FFH are all undefined. This character code table is selected when *n* is set to 255 using the character code table selection command **ESC t *n***.

1) Space page top address

Page	Character Table	Space page top address	
		7 × 9	**9 × 9**
255	Space page	FD78F6H	FD6CF6H

2) Calculating the character data top address

The character data top address is calculated as follows:

- 7 × 9 font (graphics)

  Character data top address = Space page top address + (character code - 80H) × 18

- 9 × 9 font (graphics)

  Character data top address = Space page top address + (character code - 80H) × 24

3) Example configuring the font data

- 7 × 9 font (in case of character code 90H on page 255)

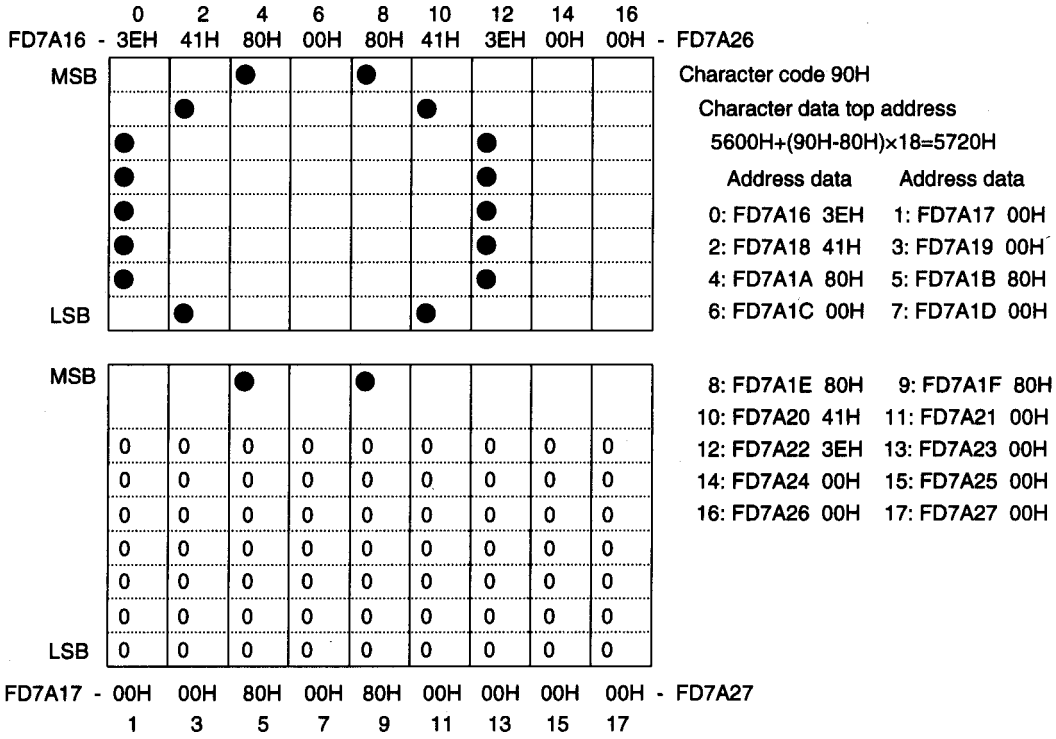


Figure D.1 7 × 9 font

- 9 × 9 font (in case of character code F0H on page 255)

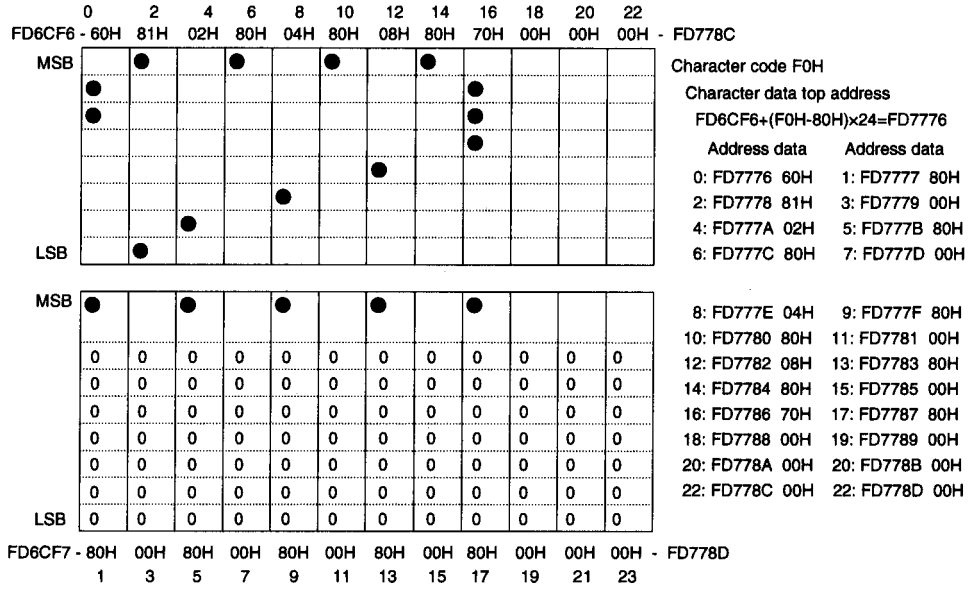
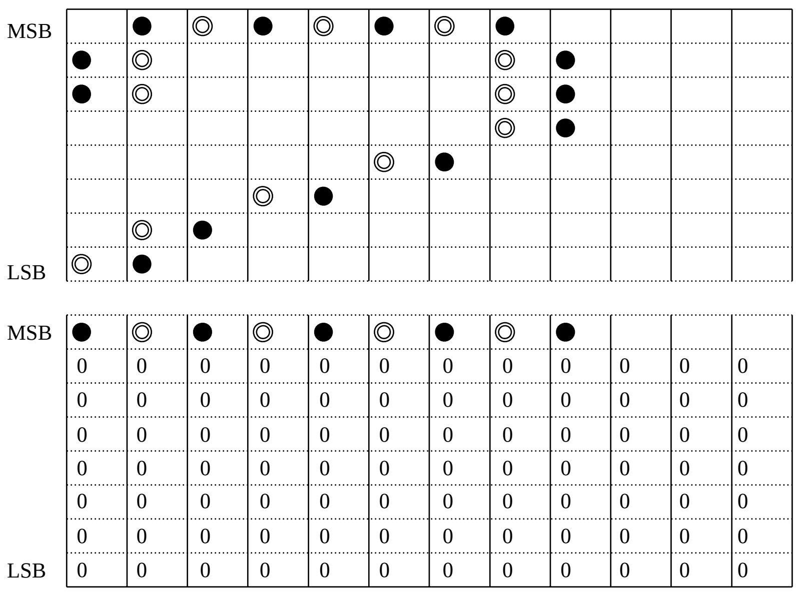


Figure D.2 9 × 9 font

Confidential

4) Notes

Do not use character patterns in which dots are horizontally adjacent.



The pattern shown above, in which ◎ and ● adjoin horizontally, is prohibited.

Figure D.3 Prohibited Dot Patterns

APPENDIX E: NOTES ON USING THE DRAWER KICK-OUT CONNECTOR

1) Drawer kick-out connector use conditions (refer to Section 2.2.3, Drawer kick-out connector)

   Because drawer specifications differ depending the manufacturer and the part number, make sure that the specifications of the drawer to be used meet the following conditions before connecting it to the drawer kick-out connector. These conditions also apply to any other devices that use the drawer kick-out connector.

   Any devices that do not satisfy all the following conditions must not be used.

   [Conditions]

   - A load must be provided between drawer kick-out connector pins 4 and 2 or between pins 4 and 5. (Operating the printer with incorrectly installed devices voids the warranty.)
   - When the drawer open/close signal is used, a switch must be provided between drawer kick-out connector pins 3 and 6. (Connecting devices other than the drawer open/close switch voids the warranty.)
   - The resistance of the load must be 24 Ω or more, or the input current must be 1 A or less. (If a device with a resistance of less than 24 Ω or an input current of over 1 A is used, the resulting overcurrent may damage the printer and the device.)
   - Be sure to use drawer kick-out connector pin 4 (24 V power output) to drive the device. Never connect any other power supply to the drawer kick-out connector. (Connecting a power supply other than that specified voids the warranty.)

     The peak current is 1 A. When energizing the drawer kick-out drive signal, follow the conditions described in 3) of Section 2.2.3, *Drawer kick-out drive signal*.

APPENDIX F: EXAMPLE PRINTING IN PAGE MODE

Example use of page mode is described in this appendix.

A typical procedure for transmitting commands in page mode is as follows:

① Transmit **ESC L** to enter page mode.

② Specify the printable area using **ESC W**.

③ Specify the printing direction using **ESC T**.

④ Transmit the print data.

⑤ Collectively print the data by sending an **FF**.

⑥ After printing, the printer automatically returns to standard mode.

Example 1: Sample program in BASIC (assumes transmission to the printer is already possible with file #1 open)

```
100 PRINT #1,CHR$(&H1B);"L";
110 PRINT #1,CHR$(&H1B);"W";CHR$(0);CHR$(0);CHR$(0);CHR$(0);
120 PRINT #1,CHR$(200);CHR$(0);CHR$(144);CHR$(1);
130 PRINT #1,CHR$(&H1B);"T";CHR$(0);
140 PRINT #1,"Page mode lesson TEST 1"
150 PRINT #1,CHR$(&HC);
```

In the program for Example 1, a printable area of 200 × 400 dots starting at (0,0) is set, and characters are printed on the first line of the area as shown in Figure F.1.

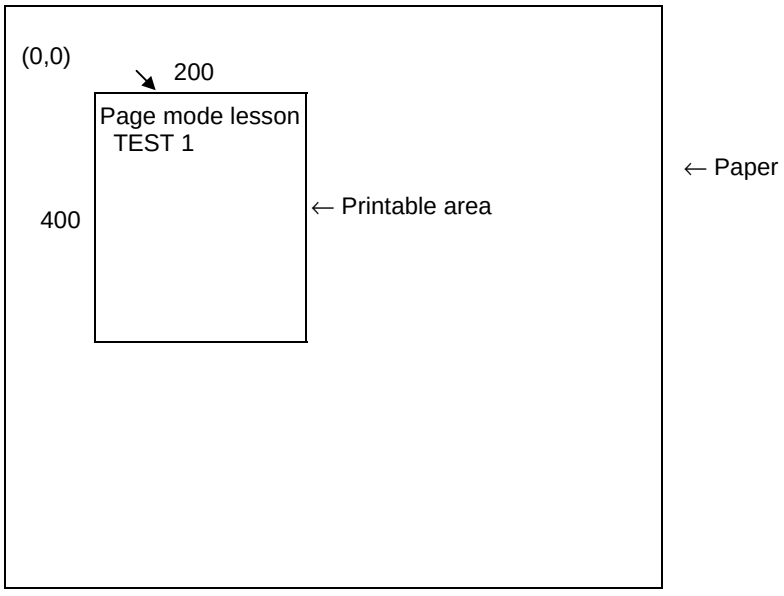


Figure F.1 Page Mode Example 1

Note that a line feed was inserted between "lesson" and "TEST 1" in Figure F.1. This line feed was inserted automatically because there was no room for the blank " " following the word "lesson" within the horizontal range of the 200 × 400 printable area. The feed amount here is that specified by **ESC 3**. Any number of printable areas can be specified before the **FF** is executed. If any printable areas overlap, however, the logical sum of the data written to the overlapping portions is used for the final printing.

It is possible to erase a portion of the data that is already developed. Using **ESC W**, specify a printable area consisting of only the section to be erased; then use **CAN** to erase the data. All the data existing in the specified printable area can be erased, even if it is just a portion of a character.

Example 2: Sample program in BASIC

```
100 PRINT #1,CHR$(&H1B);"L";
110 PRINT #1,CHR$(&H1B);"W";CHR$(0);CHR$(0);CHR$(0);CHR$(0);
120 PRINT #1,CHR$(200);CHR$(0);CHR$(144);CHR$(1);
130 PRINT #1,CHR$(&H1B);"T";CHR$(0);
140 PRINT #1,"Page mode lesson 2 CAN command"
150 PRINT #1,CHR$(&HA);
160 PRINT #1,"ABCDEFGHIJKLMNOPQRST1234567890"
170 PRINT #1,CHR$(&HC);
```

This example works as follows:

First, transmit **ESC L** to switch to page mode (line no. 100). Then use **ESC W** to send 8 parameters from *n1* to *n8* to specify the printable area. To specify a printable area of 200 dots in the x direction and 400 dots in the y direction, starting from the origin (0,0), the parameters are transmitted in the order of 0,0,0,0,200,0,144,1 (line nos. 110 and 120). In addition, the printing direction is specified as 0 by using **ESC T** (line no. 130).

After these items are specified, the print data "Page mode lesson 2 CAN command" and "ABCDEFGHIJKLMNOPQRST1234567890" are transmitted (line nos. 140 to 160). By sending **FF** (line no. 170), the printout shown in Figure F.2 is produced.

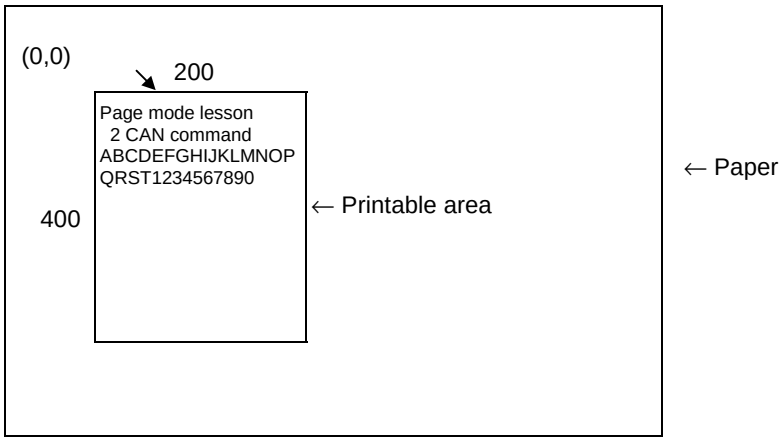


Figure F.2 Page Mode Example 2

If the program lines listed below are included before the **FF** is transmitted, a portion of the data will be deleted:

```
170 PRINT #1,CHR$(&H1B);"W";CHR$(72);CHR$(0);CHR$(96);CHR$(0);
180 PRINT #1,CHR$(51);CHR$(0);CHR$(81);CHR$(0);
190 PRINT #1,CHR$(&H18);
200 PRINT #1,CHR$(&HC);
```

If the above program is included, character string "GHI" is deleted, resulting in the printout shown in Figure F.3. When an area is deleted with **CAN**, the deleted part is left blank.

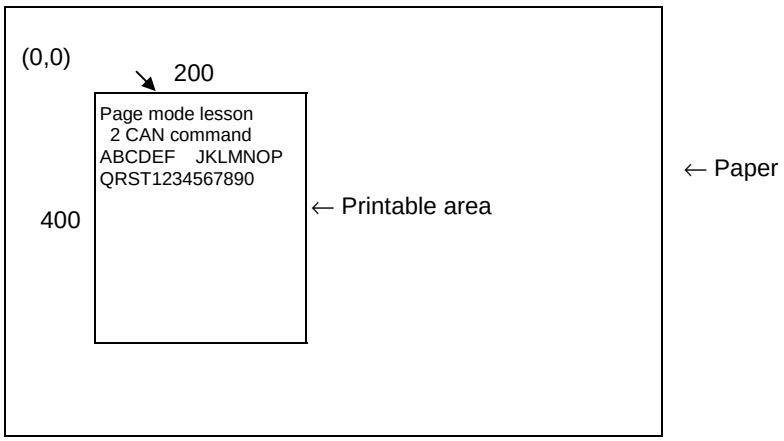


Figure F.3 Page Mode Example 3